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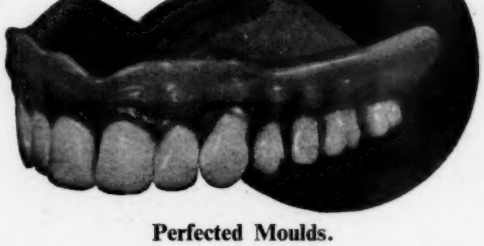

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BRITISH DENTAL JOURNAL

The Journal of the British Dental Association

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ORIGINAL COMMUNICATIONS

ORTHODONTICS IN GENERAL PRACTICE[1]

BY A. J. WALPOLE-DAY, B.D.S.BIRM., H.D.D.EDIN.

ALTHOUGH the practice of orthodontics has long been considered to be a speciality, nevertheless there being such a scarcity of orthodontists it is both necessary and desirable that some orthodontic treatment should be carried out by the general practitioner. Furthermore the National Health Service Act places a moral responsibility on the dental practitioner to provide all the necessary treatment required to secure reasonable dental fitness or if unable to provide any part of this treatment to find someone who is willing to do so.

There are many orthodontic problems that can be treated quite satisfactorily by the general practitioner, provided he has the basic knowledge necessary. This knowledge can be grouped under four headings:

(1) The growth of the face, and factors influencing or modifying it.
(2) Normal occlusion, and the natural forces that maintain it.
(3) Methods employed in diagnosis.
(4) Preventive and remedial treatment.

THE GROWTH OF THE FACE

It is one of the peculiarities of the growth of the head that its various parts grow at different rates. Thus the cranium and face grow independently of one another and even the jaws appear to have very little correlation of growth with each other.

It is only in comparatively recent years that the growth of the face has been studied on a scientific basis and it is to Brash, Broadbent and Wilson Charles that we are indebted for our knowledge. These three workers, using different methods, have given us a comprehensive picture of normal growth of the face very different from that which obtained before 1925.

The growth of the jaws differs from that of all other bones in that they contain the tooth buds of many developing teeth each of which exercises a certain stimulus and modification on the developing bone. The main principles of bone growth, however, apply to all bones and the special effect of the tooth buds will be discussed later.

The mandible is formed in relation to the cartilage of the first visceral arch, known as Meckel's cartilage and commences to ossify in the sixth week (Fawcett). The ossification takes place in the dense connective tissue surrounding the cartilage in the region of the future mental foramen. This bone is membrane bone which is built around the framework of Meckel's cartilage, the posterior end of which becomes the incus and malleus. The remainder of the cartilage is absorbed and replaced by bone. At the end of the third month accessory cartilages appear in the region of the coronoid process and condyle and quickly start to ossify. Thus the mandible is of mixed origin, partly cartilage and partly membrane bone, the body being membranous and the ramus cartilaginous, a distinction which is important in connection with its future growth and modification from birth to adult form.

The maxilla is composed of three bones, the maxilla proper, the premaxilla and the prevomer, and it is frequently the case that the palate bone is also included for convenience of description of the later stages of its growth and development. It is then referred to as the maxillary complex of bones. All these bones ossify in membrane, starting with the maxilla proper at the end of the second month and the others following in quick succession. The maxilla proper, the premaxilla and prevomer fuse together very early and can therefore be considered as one bone, occasionally however the premax-

[1] Read at the Annual Meeting of the British Dental Association, Birmingham, July 12, 1950.

illa does not unite with the maxilla on the palatal surface until after birth.

Bones grow by surface additions, by proliferation and ossification of the connective tissue at the sutures and in the case of the long bones by the proliferation and ossification in the region of the epiphyseal cartilages.

The maxilla grows both by surface depositions and absorptions and by deposition at its sutures, whilst the mandible grows by surface depositions and absorptions, by proliferation of accessory cartilages at the condyle and coronoid and for a short while at the symphysis until fusion occurs at about one year.

Broadbent has shown that the normal growth of the face is an orderly process in which the face grows downward and forward with respect to the cranial base which is relatively stable.

The maxilla moves downward and forward as a result of growth at its sutures with the cranium. The most important of these sutures are those between the frontal process of the maxilla and the frontal bone, between the malar process of the maxilla and the malar bone and between the pyramidal process of the palate bone, which is part of the maxillary complex of bones, and the pterygoid process of the sphenoid bone. These sutures are all parallel and all slope downward and backward so that if growth occurs in these sutures, the maxilla is displaced downward and forward, and that is what actually occurs. Growth is also taking place in the median suture so that lateral growth is obtained.

Sutural growth, however, does not account for all the forward, downward and outward growth of the maxilla because at the same time deposition and absorption of bone at the surfaces are taking place, particularly in the subnasal or alveolar part. Brash has shown that considerable growth takes place at the borders of the alveolus in pigs and clinical observations have shown that a similar process occurs in man.

According to Sicher, sutural growth will contribute more to the forward than the downward growth, and alveolar growth will contribute more to the downward than the forward growth. The direction of growth due to the sutures varies from about 53 degrees with the Frankfurt plane at birth to 45 degrees in the adult which means that there is relatively more forward than downward growth in the later stages of development than in the earlier. The alteration in the angles of the sutures suggests that the whole maxilla has swung forward as though hinged at the maxillo-frontal suture and indeed this is a possibility as will be shown in the discussion on the influence of the developing tooth on the growth of the jaws.

The downward and forward growth of the mandible is brought about by the growth of the condylar cartilage. In 1925 Wilson Charles showed by the examination of fœtal mandibles that main growth in height of the mandible is as a result of proliferation of the condylar cartilage which grows upward and backward thus causing the body of the bone to be displaced downward and forward (fig. 1). At the same time the body of the bone grows upward and forward. There are, therefore, two processes taking place at the same time, the growing condyle pushing the body of the mandible downward and forward while the body itself grows upward around it. Wilson Charles maintains that there is no mass absorption at the base of the coronoid process, only modelling absorption to maintain the shape of the bone. This is a very different picture from that of Hunter but all recent work tends to confirm the correctness of Charles' theory.

FIG. 1.—Untouched radiograph of 5-month fœtal mandible showing shape and position of condylar cartilage. × 2. Wet specimen from the Medical School, Birmingham.

The angle of growth of the condyles varies from about 50 degrees at birth to about 75 degrees in the adult, a variation which is necessary to allow for a high vertical component of growth at the time that the permanent teeth are erupting.

It is interesting to note here that if the condylar cartilage commences its growth at an angle with the Frankfurt plane which is too small by only a few degrees, then the forward component of growth will be greater than it should be and will eventually cause a prenormal occlusion whilst the vertical component of growth will be too small and there will be insufficient growth to allow for the normal eruption of the molar teeth thus causing an open bite in the front of

the mouth. Conversely if the initial angle of growth is too steep there will be too little forward growth and a post-normal mandible will result, the vertical component will be too large, there will be too much room for the molar teeth and consequently "close bite" in the incisor region.

Development of Normal Occlusion

In thinking of normal occlusion it is very easy to fall into the error of considering only the adult type of occlusion whereas in fact normal occlusion is a constantly developing condition which changes very much from birth to maturity in just the same sort of way in which the face changes.

At birth, according to Clinch and Sillman, the anteroposterior relationship of the gum pads should be such that the upper projects over the lower labially and buccally in much the same way as the teeth do later whilst a horizontal overbite of up to 3·0 mm. is considered normal. Miss Clinch has suggested that the oval gap that often exists between the gum pads anteriorly may be significant of normal vertical overbite later.

The horizontal overbite is usually reduced considerably by the time the deciduous teeth erupt and still further reduced later as the cusps of the molars are worn down and allow the mandible to grow forward.

Normally the deciduous teeth erupt with considerable spaces between them particularly in the incisor and canine regions. There should also be spaces between the canine and first molars but not always between the first and second molars (fig. 2).

Fig. 2.—Models of 3½-year-old child showing normal spacing.

The spaces between the molars and canines close between the age of 4 and 6 years. At the age of 4 years the distal surfaces of the molars coincide but as the cusps are worn down and the growth progresses the forward growth of the mandible outstrips that of the maxilla so that at the age of 6 years the lower second molar is half a cusp in advance of the upper one and an edge-to-edge bite has developed in the incisor region (Friel, 1938). This forward growth is necessary in order that the first permanent molars may erupt into a normal position and also to compensate for the greater difference in size of the upper and lower permanent incisors compared with the deciduous incisors.

The upper permanent incisors call for an increase in arch width of 7·6 mm. whilst the lower permanent incisors require only an extra 6·0 mm. The difference in arch width of 1·6 mm. is made up by the forward growth of the mandible (Black).

In order that this forward growth or translation of the mandible may take place, some expansion of the upper arch and attrition of the deciduous molar cusps must have occurred so that the bite is not locked. Lack of proper function in the process of mastication such as may occur where sloppy and otherwise unsuitable foods are habitually eaten will tend to prevent this wearing down process and thus prevent the normal forward growth of the mandible.

At this stage in the development of the occlusion it is necessary to consider the factors and forces which act on the teeth to produce normal occlusion.

Up to the age of 4 years the only factors of importance, apart from the relative sizes of teeth and the amount of bone to accommodate them, are those forces which act on them as a result of mastication and swallowing.

The teeth are supported in the alveolar bone in such a way that very slight pressures will cause them to move. When the teeth are closed in centric occlusion they interdigitate in such a way as to offer considerable support to each other whilst the arch shape adds additional strength. Closed in this way the teeth and supporting structures form a sort of box which encloses a very active mass of muscle which we call the tongue.

The tongue has long been regarded by Lane, Sim Wallace, McEwan, Friel and others as the mould or jig around which the teeth are arranged

in the shape of an arch or parabola. The muscles of the lips and cheeks adapt the teeth to this form, whilst the muscles of mastication act in a functional capacity.

The tongue is very powerful and during the act of deglutition exerts considerable force on the lingual surfaces of all the teeth. In the first act of swallowing the teeth are placed together and the tip of the tongue is pressed against the back of the lower incisors pressing them labially, and indirectly the lower incisors, being in contact with the lingual surface of the upper incisors, transmit this forward pressure to them. As the act of swallowing develops the tongue is applied first to the hard palate and then the soft palate, and finally the soft palate dips down and the suprahyoid muscles contract forcing the tongue firmly into contact with the lingual surfaces of the upper and lower molar teeth (Hemley). Thus the tongue tends to expand the dental arches in normal deglutition but in some instances, as will be seen later, this act is performed in an immature way and the arches, particularly the upper one, are not expanded.

This expanding force is exactly balanced by the labiobuccal musculature which consists principally of the buccinators and the orbicularis oris. Briefly the buccinator joins or is inserted anteriorly into the orbicularis oris to form the lips whilst posteriorly it passes behind the last molar tooth and is attached to the pterygo-mandibular raphe. It is prolonged backward as the superior constrictor of the pharynx and is attached to the pharyngeal tubercle on the occipital bone and to the prevertebral fascia. Together with its fellow of the opposite side it forms a continuous band of muscle with a mid-cranial and prevertebral attachment. This surrounds the teeth in occlusion and acts as a restraining force to balance the outward forces acting on the teeth.

This arrangement would tend to produce a semicircular arch form were it not for the modifying effect of certain muscles of expression, namely the zygomaticus and the zygomatic head of the quadratus labii superioris which by virtue of their posterior origins, which are on a wider base than the arch of teeth, act as a relief mechanism at the corner of the mouth and allow for the anatomically necessary upper canine prominence (*see* fig. 3).

The act of biting food has little effect on the deciduous teeth because the plane of occlusion is flat and almost on the same level as the temporomandibular joint so that the teeth are vertically opposed to each other and do not tend to be displaced when they meet forcibly together (fig. 4A).

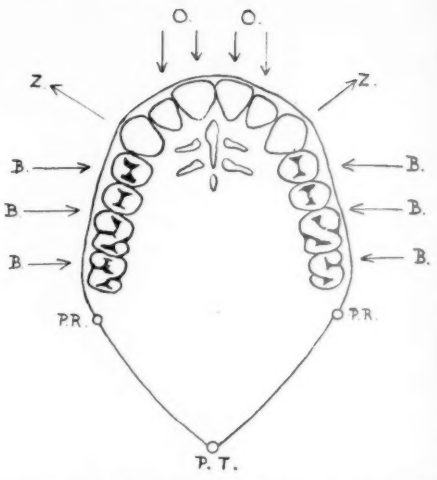

FIG. 3.—The labio-buccal musculature, showing the direction of the forces exerted by it and its posterior attachments. B. Buccinator; O. Orbicularis oris; P. R. Pterygo-mandibular raphe; P.T. Pharyngeal tubercle; Z. Zygomaticus and zygomatic head of the quadratus labii superioris.

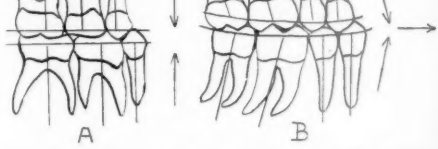

FIG. 4.—Diagram of the forces acting on the molar teeth on occlusion. A. The deciduous teeth vertically opposed; B. The permanent teeth showing the forward inclination.

After the age of 6 years when the permanent molar teeth erupt the plane of occlusion becomes more and more curved so that the molar teeth are inclined forwards. The crowns of the permanent molar teeth are not at right-angles to the long axis of the teeth and the greater bulk is mesial.

When the permanent molars and premolars strike together, the long axis of the teeth through which the forces are transmitted are at an angle to each other, and thus we have the proposition familiar to us in the physics laboratory of the parallelogram of forces, the vertical components of the force cancelling out leaving an horizontal component acting in an anterior direction (*see* fig. 4B).

It is this anterior component which is responsible for the forward drift and rotation of molars when temporary molars are extracted. It also maintains all the teeth in contact, a distinction peculiar to man, and causes a forward migration of the teeth even after the rest of the face has stopped growing. This has been well shown by Stein and Weinmann in a man aged 30 years.

Another force which starts to act on the teeth from about 4 years of age is that exerted by the developing succession of molar teeth. This was first described by Keith who contended that "the body of the sphenoid bone, the anterior border of its great wing and its pterygoid processes form the fulcrum on which the growth of the upper jaw takes place," and that the developing succession of permanent molar teeth growing downward in a curve between the roots and crown of the last tooth in occlusion on the one hand and the external pterygoid lamina on the other cause forward pressure on all the maxillary teeth and consequent growth of the whole maxilla in a downward and forward direction. Baker has conducted some interesting experiments to test this theory by the removal of developing tooth germs in pigs and has come to the conclusion that Keith's theory was indeed correct. It is probable that the change in angle of the maxillary sutures already referred to, which takes place between birth and adulthood, is the direct result of this mechanism for obtaining room for the succession of molar teeth.

The effect of the developing succession of teeth in the retromolar region of the mandible is much more readily appreciated as here the developing teeth are inclined forward and upward so that as they grow and the alveolus grows with them they exert a forward thrust on the teeth that have already erupted.

In both jaws it is this force which causes the disappearance of the spaces between the temporary molar teeth already referred to, and it is this force which causes most of the mesial migration of the teeth during the period of active growth.

To recapitulate, there are three main kinds of forces exerted on the teeth, which bring about the changes that occur in normal occlusion and maintain the teeth in their normal relationship. They are the force exerted by the muscles of the tongue and labiobuccal musculature, the force exerted during the act of mastication which causes a forward drift of the teeth and maintains the contact points but which only exists in the permanent dentition, and finally there is the force exerted by the succession of teeth developing in the retromolar region.

Effect of Habits

A thorough understanding of these three forces and the mechanism of growth of the jaws enables one to see the effect of any habit which may cause an unnatural force to act upon the teeth. Thus in thumb-sucking the effect can easily be predicted according to the manner and duration of sucking.

If the thumb is sucked at all in the daytime it will be held vertically and the pressure will cause labial displacement of the upper incisors and lingual displacement of the lower incisors whilst all the incisors will be depressed, causing open bite. The effect, however, is not limited to the teeth alone as a certain amount of pressure is exerted on the chin and this is transmitted to the condyles or growing points of the mandible. This pressure will tend to slow up or change the angle of the growth of the cartilage and cause a post-normal occlusion to develop (fig. 5).

Fig. 5.—Thumb-sucking.

Sometimes it is not the thumb or fingers that are sucked but the lower lip, or the mentalis muscle may be habitually contracted so that in either case a bulk of tissue is forced between the upper and lower incisors whilst the tongue comes forward to meet it. This will cause the upper incisors to be forced out and the lowers back with an "open bite" very similar to that caused by thumb-sucking but without the same amount of effect on the mandibular growth.

Another habit which causes a great irregularity of the teeth is that of the immature, or "tongue-between-the-teeth" swallow. We are indebted to Rix for giving prominence to this habit which passed unnoticed for so long. What actually happens is that the individual does not learn, or learns too late, the mature mode of swallowing and persists in swallowing in the same manner as a baby. When a baby swallows milk from a

teat it protrudes the tongue over the gum pads, at the same time hollowing it to form a trough, and sucking to extract the milk. The milk rolls down the trough and is swallowed without raising the tongue. If this habit persists the upper teeth do not receive the expanding pressure necessary for normal growth, whilst the excessive sucking that accompanies it tends to narrow the upper arch and press the lower incisors lingually.

Mouth breathing or the habitual mouth open habit may also cause irregularity of the teeth which can best be understood if it is realised that it is the lower lip which is principally responsible for restraining the upper teeth against displacement. Thus in the open mouth habit, the pressures on the lower teeth are little changed whilst in the upper jaw the cheek teeth receive no support from the tongue on the palatal side and the incisors no support from the lower lip on the labial side. This tends to produce a long narrow upper arch with protruding incisors.

Diagnosis

The general practitioner usually finds diagnosis rather difficult but, fortified by a knowledge of the growth of the jaws and mechanics of the teeth, aided by a little device we know as Angle's classification and encouraged by the use of X-rays, he should be able to assess the orthodontic possibilities of all straightforward cases.

The chief use of Angle's classification is to enable us to type the different orthodontic cases and get some measure of the treatment required to correct the deformity. It classifies all cases into three main groups. *Group I* contains all those cases in which the growth of the jaws is equal. *Group II* contains all those cases in which the lower jaw is behind the upper and *Group III* those cases in which the lower jaw is in front of the upper.

Angle used the relationship of the first permanent molars to enable him to group his cases but we find that these teeth are not very reliable because they drift considerably when the temporary molars are lost prematurely. The temporary canines are much more reliable, the point of the upper canine normally biting between the lower canine and first deciduous molar. In practice one uses both the molar and canine relationship to group the cases. If both tell the same story then there is nothing to worry about and if they show different conditions then some drifting must have taken place and it is not usually difficult to see where.

Having typed a particular case, if it falls into Group I it will mean that both jaws are underdeveloped, overdeveloped or normal and the resulting effect on the arrangement of the teeth will be that of crowding, open or close bite, or spacing and usually the main defects will be in the incisor or canine region.

Those cases falling into Group II will have mandibles smaller than the maxilla but this does not necessarily mean that the mandible is too small, it may mean the maxilla is too large or the mandible may be a little too small and the maxilla a little too large.

Similarly in Group III it may be a small maxilla with a normal mandible or a normal maxilla and a large mandible or some variation of these conditions.

If a case falls in to either Group II or III it is naturally of some importance to decide which jaw is at fault. Then in a Class II case with relatively normal mandible and large maxilla it would be correct to extract an upper tooth on each side and reduce the size of the maxilla to fit the mandible. If on the other hand the mandible is much too small it must be encouraged to grow.

Radiographs are of great value in diagnosis especially if they are taken in two planes, i.e. normal intra-oral and occlusal. Not only can the existence of all unerupted teeth be checked, supernumeraries be identified and the condition of the roots and supporting structures be determined, but the angle of eruption and position in the arch especially of unerupted canines can be estimated and future complications anticipated.

Treatment of orthodontic cases is largely a matter of individual preference and in most cases there are a number of ways of producing satisfactory results. The important thing is to know exactly what is required and why, the method used does not matter provided that excessive pressure is avoided and the teeth are not damaged in any way. The general practitioner will naturally prefer to use removable appliances of simple construction as they can be prepared in the laboratory and thus save valuable chairside time. The specialist on the other hand will often prefer a fixed appliance as it is more positive in action, can be set to operate for a long time without adjustment, and is the only satisfactory method of obtaining bodily movement of the teeth. As this paper is intended for the general practitioner the brief space available will be used in discussing some of the removable appliances in common use.

Removable Appliances

Removable appliances if properly designed are extremely useful and efficient in the treatment of many irregularities. It is, however, very necessary that they remain firmly in place when

worn and a number of methods have been devised in order to achieve this. Where there are adjacent teeth in the molar region pot-hooks or Norwegian cribs are extremely useful. Some people prefer the arrowhead cribs which have the advantage of being capable of modification where there is spacing of teeth due to the loss or late eruption of a premolar. Arrowhead cribs are difficult to make unless the operator has had a good deal of practice, and special pliers are required (fig. 6).

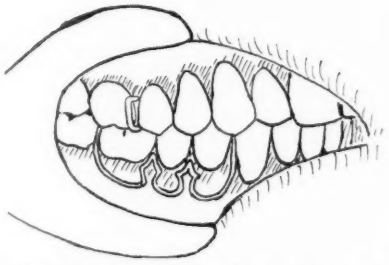

FIG. 6.—Retention of removable appliances by pot-hooks in the upper jaw and arrowhead cribbing in the lower jaw.

Where possible a removable appliance should present three points of contact with the teeth of the opposing arch in the same manner as a denture. This will ensure that it will keep in place and not tilt during mastication and is usually achieved by the pot-hooks passing over the occlusal surface between the molar teeth at the back and by adjusting the thickness of the anterior part of the plate so that the lower incisors just make contact on closure.

Many removable appliances have a labial arch which may extend from behind the last molar or be restricted to the anterior part of the mouth. This arch together with the plate forms the anchorage from which pressure is exerted on the teeth by means of auxillary springs or screws. The arch itself may be used for retracting incisor teeth or conversely it may be used to counteract lip pressure whilst the incisors are moved labially or it may be used to make the plate too large to swallow if adequate retention is not possible, but it is never intended to be used to keep the appliance in place.

It is important that the labial arch should be correctly designed and not conform too closely to the shape of the teeth especially if they are irregular because this would tend to perpetuate the irregularity. The ideal arch shape is shown in fig. 7 and it will be noticed that it is boldest opposite the canines, centrals and first permanent molars whilst it dips in a little for the laterals

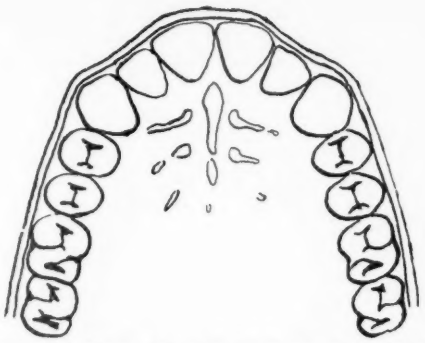

FIG. 7.—Diagram showing the shape of the ideal labial arch.

because they are normally set back at their roots and are smaller at the gum margin than either the centrals or canines. The importance of shaping this arch correctly is due to the fact that it will of necessity modify the existing lip and cheek pressures by shielding the buccal surfaces of the teeth whilst the tongue pressure is unhampered and will therefore tend to expand the teeth to conform with the shape of the labial arch. If a labial arch is used on an appliance with an expansion screw it will retract the incisor teeth, especially if the plate is cut away lingually, and this is very useful in a narrow arch in which all the teeth are in line but would be very unsatisfactory if the incisors were crowded as it would tend to accentuate the crowding.

Such a plate is very useful for changing the arch shape but if expansion is required then an arch wire should not be used unless it is frequently adjusted so that it never exerts pressure on the teeth. It is a good rule never to use a labial arch if it is unnecessary because not only does it prevent the normal friction of the lips and cheeks on the gums and teeth which keeps them clean and healthy but in most cases the patient much prefers a plate without an arch wire. Of course there are patients who are so proud of their wires that they burst into tears if they are removed and on the other hand there are patients whose teeth fail to make any progress until the disfiguring arch wire is removed.

There are various springs designed for use with removable appliances. These may be hidden in a box-like cavity beneath the plate which protects them, or they may be fixed to the labial arch by welding or soldering. The springs are usually made in about 0·35 mm. stainless steel wire and several kinds are shown in figs. 8 and 9.

Class I.—Treatment of Class I or normal occlusion cases is not usually very difficult as

slight crowding can be overcome by expansion or more severe crowding by symmetrical extraction of four premolars or molars. Individual

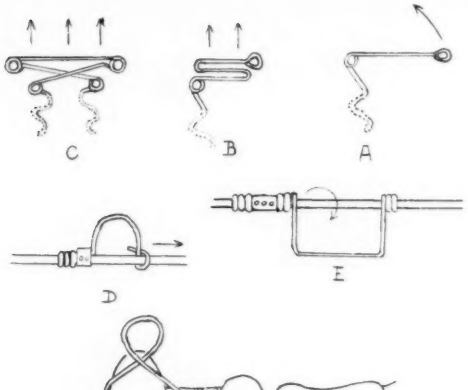

FIG. 8.—Some springs in general use with removable appliances. A. Simple spring for rotation of incisors and movement of teeth along the arch; B. Zig-zag spring very useful for forward movement of teeth and capable of great latitude in adjustment; C. Safety-pin spring for labial movement of incisors; D. Spring attached to labial arch to retract canine teeth; E. Apron spring to move labially or buccally placed teeth into line; F. Alternative method of retracting canine teeth where it is important for æsthetic reasons to avoid labial arch.

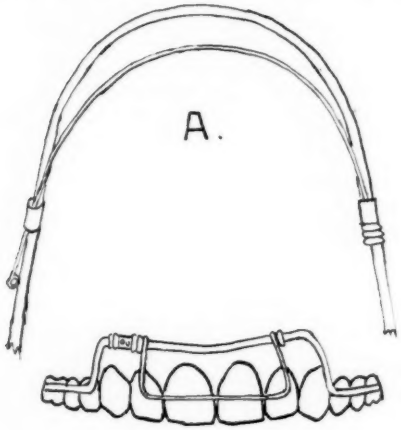

FIG. 9.—Two methods of retracting incisor teeth. A. The long retraction spring; B. A large apron spring useful for fixed appliances as it facilitates tooth cleansing and is less obvious than A.

teeth can be brought into line or rotated by the use of simple springs. The only type of case which does cause trouble is the open bite of developmental origin as distinct from open bite acquired through thumb sucking, etc. Developmental open bites do not respond readily to treatment and the general practitioner is well advised to avoid them.

Class II.—Post-normal occlusion of the mandible is the most common form of malocclusion for which treatment is sought and unfortunately the treatment is always lengthy if all the teeth are retained. Some cases, however, are really cases of prenormal maxillæ and these can be very easily and satisfactorily treated by the extraction of an upper tooth on each side usually $\frac{4|4}{}$ and retraction of the upper incisors. Lower teeth should never be extracted in cases with post-normal occlusion unless they cannot be saved. In treating post-normal occlusion where the mandible is noticeably deficient the procedure is first to correct the upper jaw so that when the lower jaw is brought forward it will articulate perfectly. This is usually brought about by expansion where the upper jaw is too narrow or by forward movement of the upper incisors where the upper incisors are retruded. The next stage in treatment is to induce forward growth of the mandible. This can sometimes be achieved by the use of an upper inclined bite-plane which causes the mandible to be brought forward in order that the molar teeth can occlude. Great care must be taken in making this appliance to see that a definite forward bite is obtained, and the patient too must play his part by using this plate intelligently. The inclined plane is intended as an obstacle to the post-normal bite so that the mandible is given every encouragement to grow. It is unfortunate, however, that a number of children use this plane as a set of upper teeth and chew all their food on it. This causes an open bite and has no stimulating effect on the mandible. There is, however, a device known as the Andresen appliance which overcomes all these difficulties. In essentials this is a glorified inclined plane which operates on all the upper and lower teeth. It is not possible in this short paper to give even a résumé of the various features of this appliance as it is a complete study in itself but it will well repay any practitioner to take the trouble to make himself familiar with all its details.

Class III.—Class III types of malocclusion, i.e. those cases in which the mandible is larger than the maxilla, can be divided into those in which the mandible is over-large, often referred to as true prenormal occlusion, and those in

which the maxilla is too small which are often called pseudo-prenormal occlusion. The latter type is often acquired through the premature loss of deciduous molars which allows the mandible to overclose and swing forward. It can also be acquired as a result of hypertrophy of the tonsil and adenoid tissue which makes breathing difficult unless the tongue and mandible are thrust forward. The lack of function of the nose causes underdevelopment of the maxilla, and the consequent mouth breathing also contributes to lack of maxillary development. Thus we have a mandible thrust forward to aid breathing and a maxilla with retarded growth so that a prenormal occlusion must eventually develop if the conditions are allowed to continue long enough.

The true Class III or prenormal occlusion is due to overgrowth of the mandible, particularly the condylar cartilage. Such a condition is naturally difficult and stubborn in treatment and in severe cases or where the condition has progressed too far the only successful treatment is surgical. If the condition is treated early enough some measure of success can be obtained but this will vary with each individual. These cases are often inherited and if there is evidence of this then difficulty is sure to be met.

The treatment of these cases is designed to retard the growth of the mandible by applying pressure to the condyle and encouraging the growth of the maxilla by forward and lateral expansion. The acquired types of Class III occlusion often have excessive overbite, especially those due to early loss of temporary molar teeth. These can be readily treated by means of a cast inclined plane cemented to the lower incisor teeth or a covered molar plate with incisal springs. The inclined plane has the advantage of reciprocal action by pressing the mandible back and the maxilla forward and works well if there is a large overbite, whilst the covered molar plate is better if the overbite is small. In more severe cases it may be necessary to use a chin cap and head harness to apply pressure to the chin. This is used in conjunction with the inclined plane or covered molar plate as it is necessary to unlock the bite to be successful. Another method of treating these cases with removable appliances has been devised by the advocates of the Norwegian or Andresen appliance. This is an ingenious modification of the Andresen appliance by which the lower half of the plate can be gradually moved backwards by turning a screw of the Glenross type which is situated anteroposteriorly. This is sometimes called the split Andresen and whilst I have no personal experience of this appliance I have heard very good reports of its use.

Preventive Treatment

Finally there is the question of preventive treatment, and whilst it is generally agreed that many dental abnormalities are inherited or present before birth and cannot therefore be prevented, there are still a large number of acquired malocclusions. The malocclusions due to habits are obvious and can usually be cured if the parents are conscientious. If sucking cannot be cured then it is better that the child should have a dummy rather than a thumb. A great deal of tact is required in handling children with sucking habits, e.g. if a child is to wear fingerless gloves or bags to stop thumb sucking then Teddy should also have a pair to wear.

Many underdeveloped jaws are due to insufficient exercise. The tongue being the chief expander of the dental arches is composed entirely of muscles and like all muscles will grow strong if exercised regularly. Children should be encouraged to eat food which requires chewing and I frequently advise chewing gum for the same purpose. If chewing gum is given it should be chewed with the lips in contact and after meals, and it should be remembered that normal function as well as good muscular development is necessary.

The most common cause of acquired malocclusion is the premature loss of temporary molar or canine teeth. The loss of temporary incisors is of little significance as these should always be spaced but the loss of temporary molars or canines inevitably leads to forward drifting of the permanent molar teeth and failure of the anterior teeth to grow forward in the normal manner so that the permanent canines or premolars have insufficient room to erupt into the arch. It is most important that the temporary dentition should be conserved to the best advantage. The teeth should not be extracted because they have cavities too large to fill but only if they are septic or painful. Many badly decayed temporary molars last for years and give no trouble if they are treated with several applications of silver nitrate. If the teeth are lost space retainers should be fitted wherever possible.

In conclusion there is no summary as this paper itself is only a summary of orthodontics and as such is intended to guide and stimulate interest in orthodontics amongst general practitioners in the hope that by arousing their interest they may be better able to advise and treat their young patients.

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Discussion

Mr. Walpole-Day, in presenting his paper, said he had been criticised in the past for encouraging the general practitioner to do some orthodontics. He had always taken the attitude that, whatever he did or said, the general practitioner would do some orthodontics anyway, and what he was concerned about was that it should not be done any way, but that help should be given to allow it to be done the right way.

Miss L. Clinch said that it was a very great pleasure to hear a paper on orthodontics which emphasised diagnosis rather than technique. The idea of changing occlusion which Mr. Walpole-Day emphasised was probably the foundation of orthodontic diagnosis, and certainly one of the foundations. It was as long ago as the first International Orthodontic Congress in 1926 that Professor Friel first showed the changes which occurred, and she thought that very often enough emphasis was not laid on those changes.

At birth there was a bite of the gum pads. It was possible to get the gum pads to come together in the same relationship time and time again, even in a child less than ten days old, and there was no comparison whatever between the bite which one got with the gum pads and that of an edentulous adult, where it was hard to get a relationship between the jaws, much less between the gums.

She was not very happy about Angle's classification, because it was based on the false premise that the upper first permanent molars were always in normal relationship with the rest of the masticatory face. She found that, to get the diagnosis clear in her own mind, the best thing to do was to write down what was normal and what was abnormal, and then she could get a picture of what was wrong ; otherwise one would say that such and such a case was an Angle's Class II, Division I, except for something, which might put the whole diagnosis out.

Preventive orthodontics provided an immense field for research, and that was what was wanted more than anything else. Mr. Walpole-Day mentioned chewing as one of the factors in preventive orthodontics, and of course he was quite right, but the reason which he gave was that the chewing, being function, increased the power of the muscles and made the bone grow. She used to think that too, but she was not so sure about it now. Recently she had been interested in some skulls of Australian aborigines in which there was enormous attrition right down to the pulp chambers, and yet in a considerable number of cases there was imbrication of the teeth. To her mind the main value of chewing, in the deciduous dentition in particular, was that it wore down the very sharp cusps of the deciduous teeth and therefore allowed the normal changes in occlusion to occur, so that there was normal development and the teeth were not locked in incorrect positions.

Mr. Walpole-Day mentioned that probably the general practitioner would prefer to use removable appliances rather than fixed, and she agreed, but she had a strong impression—she did not think that it was just her imagination—that many dental surgeons suffered from the delusion that orthodontists tried to make orthodontics more complicated than it really was. It was time that orthodontists were acquitted of that charge. If anybody would tell her a simple way of treating her cases she would be very happy indeed, provided that simple way led to good results. There was nothing easier than to put a plate in a child's mouth and make the parent happy, because the parent had done her duty and had the child treated, but that was not orthodontics. They had to aim at getting the best result in each case and she did not think that there were simple methods which would correct complicated cases.

Mr. Digby F. G. Came asked whether Mr. Walpole-Day thought that spittle-swallowing was the main factor in the development of the jaw and positioning of the teeth. Mastication took place only at certain times during the twenty-four hours, whereas spittle-swallowing went on continuously, and with the factor of the tongue being pushed against the teeth when the mouth was properly closed, the jaw was moulded on the form of the tongue. When that function did not take place one got malocclusion, an open mouth and a deformed jaw.

He would also like to know whether Mr. Walpole-Day agreed that the drift back of lower premolars, and especially the second premolar, was due to the force of the soft tissue of the tongue pushing itself in between the first and the second premolars and meeting the pressure of the buccal muscles and pushing the tooth backwards until, as he had seen in many cases, it drifted right back to the second molar region.

Mr. Walpole-Day thanked Miss Clinch for her very valuable contribution to the discussion. It would be generally agreed, he said, that the tongue did exert quite an influence on the shape of the mouth, but people had slightly varied ways of swallowing. No one would deny that the lower central incisor erupted lingually, and if there was room for it to move forward into its correct position when the temporary incisor was lost the tooth did assume its normal position, and only the tongue

could have done that. It might not be so much that the tip of the tongue exerted a great pressure on the incisors when one swallowed as that when the tongue was at rest it rested against the lower incisors.

He did not think that chewing made any difference to the basal bone, but using the tongue had some moulding effect on the teeth and the alveolar part of the bone.

He did not think that swallowing was the main factor in forming good occlusion, though it was an important one. There were many other factors which came in. The way in which the tongue was used made a difference, and the way the mandible was moved would also make a difference, and there were other factors. He had seen cases where the tongue had been missing and the arch of the teeth had collapsed, and he had seen cases where the tongue was very large and the spacing between the teeth was large and had nothing to do with swallowing at all.

One of the important things about the tongue was its rest position. Some people held their tongue in the normal way slightly overlapping the lower molars. One patient held her tongue very low and hollowed out the alveolar bone in the region of the roots of the molar teeth ; the upper arch was almost insignificant in size, and the tongue never got up to the plane of occlusion.

The question of the drifting back of the lower second premolar was one which Professor Friel had answered very well. Had Mr. Digby Came actually watched a lower premolar " drifting back " into contact with the second molar or had he just seen the 5 in contact with the 7 and assumed that it had drifted back ? His own experience was that if the first permanent molar was lost after the premolars had erupted there was a certain amount of space between the 4 and the 5, but it was not a drift back but a tilting of the tooth, due to the fact that on biting, small particles of fibrous material were forced between the contact points of the 4 and 5 and, not being immediately removed, caused a space to occur which gradually enlarged. He had seen lower second premolars in contact with second molars, and the case histories almost always showed that the lower second deciduous molar had been extracted, so that the pressure forward of the developing molar teeth had not been transmitted to the unerupted premolar, and therefore it had not been carried forward as it should be and had been left back in its original position. Later on the 6 was extracted and eventually the 5 erupted nearly in its original position right up against the 7. It was not that it had drifted back, but that it had never been pushed forward. He thought that was the general opinion on the question of how those teeth got into that position. It was very seldom that one saw a second premolar drift back after it had erupted ; it might tilt, but it did not drift.

Professor H. HUMPHREYS apologised for asking a question, in view of the fact that he was not an orthodontist, but one of those " lower forms of life " that were concerned with administration. The question which he wished to ask, he said, was, however, one of the biggest headaches of administrators like himself who served on regional hospital boards and were expected to give advice to the Ministry through the Dental Advisory Council. It was a question which was implicit in the title of the paper and explicit in the remarks of Miss Clinch, namely, to what extent should orthodontic cases be treated by general practitioners.

There was general agreement that there were considerable numbers of cases which should be treated only by highly-trained, whole-time specialists. The opinion had been expressed that all cases should be so treated, but he would like to remind the meeting of the figures. There were 6,000,000 school children in this country, and reliable estimates by the British Society for the Study of Orthodontics and others, showed that between 5 and 10 per cent of those children required orthodontic treatment. If 10 per cent was the correct figure, it meant that 600,000 school children should be under treatment at any one time. As practical people, they knew that the supply of whole-time orthodontists on anything like that scale was not possible in any foreseeable future.

There might be something to be said for hitching one's wagon to a star and urging only counsels of perfection, but in that case one would have to say that no one should ever extract a tooth. In this mundane world it was necessary to take account of realities, and some answer had to be given to this question. He did not expect it to be given at once, but unless orthodontists got together and tried to produce something, then an answer, and possibly a bad answer, would be produced by civil servants in Whitehall. Somebody had to produce it, and he would much prefer it to be produced by the orthodontists.

Mr. G. L. WILKINSON expressed strong support for those general practitioners who said that the orthodontist made orthodontics much too complicated.

He wanted to talk about one principle which was relevant to what Professor Humphreys had said, and absolutely relevant to the question of general practitioners doing orthodontics. He himself was a general practitioner, but for twenty-two years he had been a lecturer in orthodontics at Leeds University, and he still ran a clinic there. He had been in practice for thirty years or more.

The principle which he wished to enunciate was this. Mr. Walpole-Day wrote " Post-normal occlusion of the mandible is the most common form of malocclusion for which treatment is sought and unfortunately the treatment is always lengthy if all the teeth are retained. Some cases, however, are really cases of prenormal maxillæ and these can be very easily and satisfactorily treated . . . " and so on. Personally, he had thought a great deal about this, and he had almost never found cases of true post-normal occlusion. What was a post-normal occlusion ? That was what fogged the general practitioner. He himself did not believe in this repositioning of the mandible. Almost always good results could be obtained by taking out upper teeth, and sometimes lower teeth. The best and easiest way of retracting upper prominent teeth was by elastics, and one of the best ways of pushing any teeth was by screws—both with removable appliances.

Mr. Walpole-Day had said that the question of what appliance was used was not so important as the question of why it was used. His own conception of true post-normal occlusion was that the molars and premolars in the lower jaw were posterior to the coronal plane, the

plane between the ears. He had practically never seen it. Some people might say that he was talking nonsense, but in the clinic in Leeds they had very many cases sent to them by general practitioners who said " I cannot treat this ; it is too difficult for me. The lower jaw is under-developed, and it will take a long time to push it forward." As a matter of fact the lower jaw was perfectly normal, and his experience over many years was that almost all the cases were merely cases of superior protrusion, which were very easy to treat if dealt with in the right way, and the lower jaw was almost never post-normal.

Mr. WALPOLE-DAY said there were many cases coming in for treatment in the Birmingham area which they called post-normal, and they tried to make the lower jaw grow forward if they could but if the bone had not the inherent power to grow one could not make it; one could only encourage it. He still believed that post-normal occlusion did exist, but there was, of course, the pre-normal maxilla as well, and he agreed that the pre-normal maxillary cases were much easier to treat than the post-normal mandible.

He did not think that it was always possible to accommodate 32 teeth, and there was a place for extractions, but one could embark on a course of extractions for orthodontic reasons only with considerable knowledge of what one was doing. He thought that it was very unwise to preach the symmetrical extraction of first permanent molars, because one could run into any amount of difficulties from drifting, closing bite, and if teeth were extracted in the lower jaw in a case of post-normal occlusion it was almost hopeless to treat it.

He thought that one of the answers to Professor Humphreys was that some research must be done into the question of whether there was a simpler way of treating some orthodontic cases, and whether an appliance was necessary in every case or whether there was a simpler method of treatment so as to make it possible to deal with much greater numbers of cases. That could be done only by taking complete records, including cephalometry, and following up cases over a long time without actual interference and seeing what happened. He hoped that it would prove possible to find simpler methods. He did not mention elastics in the paper because although they did use elastics they needed controlling very carefully, and they were not, he thought, for the general practitioner.

Mr. G. M. YARDLEY said that he had done a certain amount of general practitioner orthodontics, and one type of case which he met with was where there was some post-normal occlusion, associated with pre-maxillary protrusion. He understood that Mr. Walpole-Day had no objection to, and in fact encouraged, the removal of teeth in the bigger jaw but not in the smaller jaw, and that was in line with what Mr. Harold Chapman had taught for some time. The difficulty which arose in cases where one did not extract teeth in the lower jaw was the impacted wisdom tooth, because it was almost invariably in those jaws that trouble was experienced with erupting wisdom teeth. He would like more guidance from Mr. Walpole-Day on what to do when one did not extract teeth in the lower jaw. It seemed to him that one must accept post-normal occlusion and bring that lower jaw forward if one was going to leave two teeth in the lower jaw and take two out in the upper jaw.

His second question was this : in view of the fact that chewing did encourage, or could be presumed to encourage, bone growth, at what age should one remove the six-year-old molar ? If it were removed fairly early there would be a lack of bone growth and therefore a smaller jaw, while if it was left too late presumably the hoped-for result would not be obtained.

Mr. WALPOLE-DAY replied that the impacted third molar was a real problem, but it seemed to him that if one were going to get an impacted third molar tooth, and all the other teeth were good and sound and in good mechanical and functional occlusion, there was no great loss in extracting the impacted wisdom tooth ; or, if it was in such a position that it might come into useful occlusion at the age of 18 to 20, when this condition started to give trouble he saw no reason why the second molar should not be extracted. The important point about extraction was that if teeth were taken out too early space was going to be lost, because the series of teeth had been broken, and all the advantage which had been obtained from the pushing of the molar teeth on the rest of the arch would be lost, so that if a lower first molar were taken out too early all the anterior teeth in that segment of the jaw would be deprived of that stimulus to forward growth. If room was needed the tooth should be taken out as late as possible, so as to get the maximum effect on the jaw from the developing teeth in the retro-molar region.

With regard to wisdom teeth, they should be taken out as late as possible, because they were pushing on the rest of the teeth and would tend to push the others forward. If there were perfect occlusion and the wisdom tooth started buckling up incisor teeth the thing to do was to take out the impacted wisdom tooth. As for the definite age at which to extract a first permanent molar, that depended on why the room was wanted. If it was to reduce the number of teeth because there was not room on the bone for them all, the best time might be at about 11 years of age, when the second molar was coming through. When assessing the orthodontic possibilities of a patient one should take into consideration the length of life of the first permanent molar teeth, and decide whether the patient was going to keep them until the age of 18 or 20. If not, one had to plan for the removal of them so that the space could be used to the best advantage, or, if there were too much space, so that the space could be allowed to close to the best advantage. It was necessary to weigh each case on its merits and understand exactly what happens when teeth are taken out.

Mr. J. MURRAY, who proposed a vote of thanks to Mr. Walpole-Day for his very lucid and informative paper, commended the suggestion made in the paper that general practitioners should treat some of the simple cases. That should to some extent relieve Professor Humphreys's mind, and in any case it would afford an excellent alternative to the deadly dull routine of continuous conservative work. Mr. Walpole-Day had rightly given the wider vision of a facial entity containing teeth as part of that entity.

The vote of thanks was seconded and carried by acclamation.

OBSERVATIONS ON EXPERIMENTAL DENTAL CARIES. XV. DOES GONADECTOMY INFLUENCE CARIES ACTIVITY?

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MANY workers who have been using the golden hamster for dental caries investigations have reported that males exhibit a higher caries susceptibility than females. This difference has been consistent and significant when the diets used have been of a low or moderate cariogenic power. We, on the other hand, have found no sex difference in caries susceptibility of the hamster, using exactly these kinds of rations in a good number of experiments. The possibility of strain differences with respect to sex-specific differences in caries susceptibility of the hamster was suggested [1].

Furthermore, Keyes reported that castration of male hamsters significantly reduced their susceptibility to caries activity, and that ovariectomy tended to reduce the incidence of caries in female animals [2]. However, in a later experiment in which the same author compared the caries activity of control hamsters, castrated animals and castrated hamsters implanted with testosterone propionate, less clear-cut results were obtained [3]. Since in these experiments a high caries-producing diet had been used, it was concluded that the sex difference in caries susceptibility of hamsters is best demonstrated when the caries activity is not too great. As mentioned previously, this is at variance with our findings [1].

Since in our colony hamsters do not exhibit sex difference with respect to caries susceptibility, under these conditions we have studied the possible effect of gonadectomy on caries activity, using a low caries-producing diet. We are herewith reporting the results of these experiments.

EXPERIMENTAL

Thirty hamsters (20 males and 10 females) between 22 and 25 days of age, from litters of a colony maintained for three generations on the stock diet presented in Table I and raw milk, were litter-mates distributed into two equally large groups (10 males and 5 females in each). The animals of group 1 (control) were sham operated. Group 2 (castrated) was gonadectomised under ether anæsthesia, using ordinary aseptic procedures. No post-operative complications occurred in any of the animals.

Both groups were reared, in screen-bottom cages without bedding, on the cariogenic diet presented in Table II for a 100-day experimental period. The ration and tap water were available *ad libitum*, and all the animals were weighed weekly. The average initial weight of the two groups was essentially the same.

TABLE I.—STOCK COLONY DIET, IN PERCENTAGES

Dry hog liver powder	3
Alfalfa meal	3
Salt mixture*	3
Whole wheat flower	8
Powdered yellow corn	10
Brewer's yeast	10
Crude casein	17
Sucrose	46

*The salt mixture used was McCollum's Salt Mixture No. 185 supplemented with 13·5 mg. KI, 139 mg. $CuSO_4$, $5H_2O$, and 556 mg. $MnSO_4$, $4H_2O$ per 100 grammes.

TABLE II.—EXPERIMENTAL DIET, IN PERCENTAGES, FED TO THE TWO GROUPS

Salt mixture*	1
Alfalfa meal	2
Brewer's yeast	5
Powdered whole milk	22
Finely ground yellow corn	25
Finely powdered sucrose	45

*The salt mixture used was McCollum's Salt Mixture No. 185 supplemented with 13·5 mg. KI, 139 mg. $CuSO_4$, $5H_2O$, and 556 mg. $MnSO_4$, $4H_2O$ per 100 grammes.

On completion of the experimental period the animals were killed with chloroform and autopsied. The molars were prepared for examination and the carious lesions were recorded and scored as previously [4].

RESULTS

Fig. 1 presents the average growth curves of the two groups, males and females taken separately. The following can be seen: (1) The control females grew more than control males, in accordance with what is often the case in hamsters. (2) Castrated females grew much more than control females and control or castrated males. (3) Castrated males grew much more than control males and appreciably more than control females. In other words, fig. 1 shows clearly that gonadectomy increases markedly the growth rate and body-weight of both male and female hamsters. The results of the present controlled study of the growth of normal and castrated hamsters are at variance

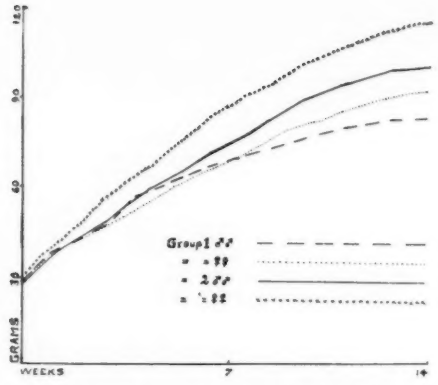

FIG. 1.—Average growth curves of the two groups, males and females separately. Group 1, normal control hamsters. Group 2, castrated animals.

with what Keyes has reported after analysing the differences in body-weight of the animals only at the end of the experiment [2].

Table III shows the caries activity of the two groups. Beneath the average number of carious

TABLE III.—CARIES ACTIVITY OF THE TWO GROUPS

	Group 1 (control)			*Group 2 (castrated)*		
	♂♂	♀♀	♂♂+♀♀	♂♂	♀♀	♂♂+♀♀
Number of experimental animals	10	5	15	10	5	15
Percentage of animals affected	100	100	100	100	100	100
Average number of carious molars ...	7·4	5·8	6·9	7·2	7	7·1
Standard deviations	± 0·5	0·7	0·4	0·4	0·4	0·3
Average number of carious lesions ...	10·8	6·6	9·4	9·5	10	9·7
Standard deviations	± 1·0	1·1	0·9	0·8	0·5	0·6
Average caries scores ...	6·8	3·5	5·7	6·8	7·1	6·9
Standard deviations	± 0·9	0·8	0·7	0·9	1·8	0·8

molars, carious lesions, and caries scores are presented the standard deviations of the means. The results presented in this table show: (1) Control males exhibited a slightly higher caries activity than control females. (2) Castrated males exhibited the same caries activity as castrated females. (3) Control males exhibited the same caries activity as castrated males. (4) Control females exhibited a somewhat lower caries activity than castrated females. (5) Taking males and females together, the control group exhibited essentially the same caries activity as the castrated group. Thus the results of the present experiment lead to the conclusion that under the conditions established for the experiment, gonadectomy does not influence the caries susceptibility of the male hamster, but increased, somewhat, caries activity in females.

Since the present results are clearly opposed to what Keyes has found in his work on this subject [2, 3] it appears to be important that other investigators working under various experimental conditions should carry out further studies on the possible effect of gonadectomy on caries activity. In this way it might be established whether under certain conditions, different from those of the present experiment, gonadectomy actually influences appreciably caries susceptibility in the hamster.

SUMMARY

The influence of gonadectomy on caries activity has been studied in two groups of weanling hamsters of both sexes, reared on a low-caries producing diet for a 100-day experimental period.

The results showed that gonadectomy does not influence in any direction the caries susceptibility of male hamsters, but increases somewhat the caries activity in females. Some implications of these findings have been briefly pointed out.

Furthermore, the present investigations have shown that gonadectomy increases markedly the growth rate and final body-weight of both male and female hamsters.

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SHORT COMMUNICATION

EXTENSIVE COMPLEX COMPOSITE ODONTOME OCCUPYING THE WHOLE OF THE LEFT MAXILLA

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AN adult, policeman, aged 30, reported with marked swelling of the left maxilla. Although aware of the deformity for a very long time he had not sought any help as the deformity gave him practically no inconvenience. About three years previously the patient noticed the eruption of some irregular denticles in the mouth. These had caused no pain or discomfort until a few days before reporting for treatment, when the swelling had suddenly increased considerably, and was accompanied by a profuse discharge of pus and acute pain.

On examination, the left maxilla was swollen buccally and palatally and all the teeth posterior to the upper left first premolar were missing but there was no previous history of extractions. A large irregular calcified mass of dental tissues was found occupying the region of the missing teeth, $\overline{|5678}$. This was slightly loose and surrounded by ulcerating mucoperiosteum with a purulent discharge. The opposing teeth of the same side were in occlusion with this calcified mass which indicated that it had been functioning for quite a long time. The clinical appearances suggested the presence of a large complex composite odontome.

The patient was admitted to hospital and local efficient drainage was established. When the general condition had improved, impressions were taken for record models (fig. 1). Radiographs showed the

FIG. 1.—Upper and lower models, showing the occlusal surface of the odontome.

presence of an extensive complex composite odontome, entirely occupying the left antrum and encroaching superiorly on the infra-orbital plate. Posteriorly the odontome reached the pterygoid fossa short of the pterygoid lamina, anteriorly it was separated by a very short distance from the wall of the maxillary sinus, and medially it had pushed the lower part of the nasal bone inwards and had materially narrowed the left nasal fossa.

Under general anæsthesia (nitrous oxide and oxygen), the odontome was removed surgically. The buccal mucoperiosteum and bone were dissected out and the odontome removed with some difficulty. Part of the septic granulation tissues came away attached to it, and the rest was carefully curetted out of the cavity. On exploring the huge cavity another calcified mass was seen. This was removed and when adjusted in its place in the odontome it was found to fit accurately. The cavity was packed with acriflavine gauze for twenty-four hours, after which daily irrigations were carried out. Radiographs taken one week later, to our surprise, showed the presence of another calcified mass, molar-like in shape, lying high up on the lateral

FIG. 2.—Buccal surface of odontome.

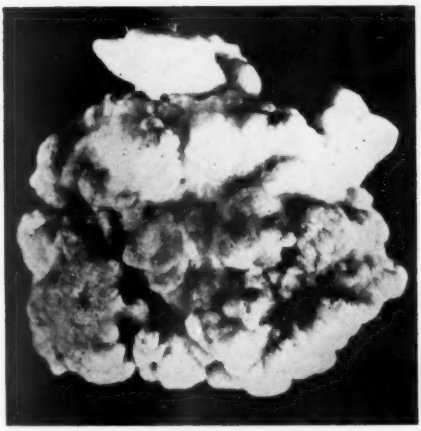

FIG. 3.—Palatal surface of odontome.

nasal wall. This denticle was removed and another calcified mass was found behind it. Both denticles and the odontome were assembled together in their proper positions where they have articulated tightly. One month later the patient was radiographed but no remaining denticles were seen.

Description of the Odontome.—The odontome after being cleaned and completely dehydrated weighed 59·050 grammes, i.e. = 909·37 grains. Its dimensions were antero-posterior 49 mm., vertical 52 mm., bucco-palatal 41 mm. (figs. 2, 3, 4, 5).

The mass was irregularly calcified, with multiple canals and foramina. On the antero-lateral and superio-palatal surfaces there were two more or less well-formed molars with their roots curved posteriorly. With the exception of the enamel covering the crowns of these two molars, the whole mass seemed to be covered in some areas by cement and in others by dentine, while in other places bone-like tissue could be seen. To the best of our knowledge, this odontome is the heaviest yet recorded in human beings.

FIG. 4.—Anterior surface of odontome.

FIG. 5.—Posterior surface of odontome.

EVERYDAY PROCEDURES IN DENTISTRY

LOCAL ANÆSTHESIA IN CONSERVATIVE DENTISTRY

BY GEORGE FRIEND, L.D.S.BRIST.

No form of anæsthesia is desirable in itself. All have dangers and disadvantages. Where conservative dental operations can be carried out without strain to patient or operator there is no doubt that to work without anæsthesia is the best procedure. Nevertheless in many conservative dental operations the use of some form of anæsthesia will be such a boon that without it the work becomes difficult or even impossible. Where pain is severe the patient can be relieved of tension, the muscles relaxed and the salivary glands at rest—all conditions which greatly assist the work of the operator.

The conservative operations for which some form of anæsthesia is desirable include—the preparation of carious cavities for treatment by filling; the removal of the dental pulp; crown or bridge preparations; apicectomy; parodontal treatment.

In preparing cavities for fillings most cavities in adolescents will require anæsthesia if they are to be adequately prepared. A recently formed small carious spot needing extension will need it more than a large cavity which has remained untreated for a long time. Where the line of dentinal tubules between tooth area to be cut and pulp has been undermined by caries there will be no pain. Cutting live tubules which have an unbroken line to the pulp usually causes pain. Extension to a sound enamel—dentine margin is essential to good cavity preparation and if this involves cutting healthy tissue it can be very painful.

Removal of the dental pulp obviously demands some form of anæsthesia. Crown preparations will often involve removal of the pulp or, if jacket crown in type, will certainly require anæsthesia except in old or devitalised teeth. Bridge preparations can sometimes be done without anæsthesia but usually only in middle or old age. Apicectomy requires an especially effective anæsthesia. It is surprisingly difficult to get full anæsthesia at the back of the absorption area at the apex of an infected tooth.

Intra-alveolar anæsthesia will achieve this and has the added advantage of not causing swelling in the loose tissues overlying the apical area. Gingivectomy or other parodontal treatment only requires anæsthesia of gum tissues, which is easily obtained. Papillary injections are adequate but so many needle insertions are needed that general analgesia is much appreciated while this is being done.

To use a routine method of local anæsthesia for all patients is a needless handicap. Each patient presents an individual problem. To have all possible techniques at your disposal and then choose the most suitable for each operation is the aim to be set.

The methods in use today are :

(1) The application of cold by
  (*a*) Ethyl chloride spray.
  (*b*) Cold water jet.
  (*c*) Atomised spray.
(2) The surface application of local anæsthetic agents :
  (*a*) Cocaine on mucous membrane of nose.
  (*b*) Cocaine by pressure on exposed pulp.
(3) The injection of local anæsthetic agents into :
  (*a*) Submucous area.
  (*b*) Regional nerve area.
  (*c*) Intra-alveolar area.
  (*d*) Parodontal membrane.
  (*e*) Dental pulp itself.

Application of Cold

Ethyl Chloride for local anæsthesia in cavity preparation

The following technique is written by Norman Gray.

"The value of E.C. for local anæsthesia in cavity preparation is perhaps not so well recognised as its much less effective action in connection with the extraction of loose deciduous teeth. Its action is instantaneous, the duration of anæsthesia 60 to 90 seconds.

E.C. is particularly suitable for anæsthetising cervical cavities in the anterior part of the mouth but once one gains proficiency in its use, this area can be very materially extended. The main problem is the preparation of the patient. It does need a word of explanation that the first application of cold causes pain for one or two seconds but if you state this fairly and promise that the actual cavity preparation can be done without any pain at all the difficulty vanishes.

This preparation of the patient is essential, however, because if cold is applied to the tooth without warning, the patient will draw away needlessly frightened and there will be no anæsthesia. The first shock passes in a moment and is only akin to the pain of a needle prick.

The tooth to be treated must be kept dry during the entire preparation of the cavity. Place a saliva tube in the mouth and cotton rolls to isolate the area, dry the cavity with amadou or cotton-wool.

Apply the E.C. capillary spray from roughly 9 in. away, applying to the adjacent gum first, telling the patient again that it will hurt for just two seconds—'now,' as you bring the spray right into the cavity. Hold on deliberately for 5 to 6 seconds until frost appears on the gums.

Meanwhile the surgery attendant has taken up her position on the opposite side of the chair with the warm air syringe ready in her right hand. With the left hand she takes the E.C. spray bottle from the dental surgeon. The handpiece with selected drill already inserted is also ready to hand and the cavity is immediately cut quite deliberately. The attendant gently blows the chips away from the cavity as the cutting is taking place so that the operator has a clear view of the cavity.

A second application can be safely made but is not usually necessary if everything is ready beforehand.

The teeth stand short periods of cold extremely well, much better than short periods of over-heating. Complete anæsthesia lasts for about a minute after application and sometimes a great deal longer. Always allow the cavity to warm up with normal saliva before asking the patient to rinse out."

Cold Water Jet

A constant jet of cold water on the tooth cavity while it is being cut reduces the sensitivity of the area.

The jet should be as fine as possible and be applied first drop by drop to the tooth, as the sudden squirt of a jet of cold water is extremely painful. An assistant with a hand steady enough to direct it to the right spot and an efficient sucker are needed. This technique has been greatly used since it was introduced by Guy Ellingham and it has proved of real value in dental practice. It is of most use for the simpler preparations such as occlusal cavities in molars, incisor cavities when opened from the labial side and buccal cavities. Interstitial cavities usually need a more lasting and deeper anæsthesia. Like all techniques it has its limitations but it has no dangers and few disadvantages.

An atomised spray of air and water can be used. The spray can be conducted by a small tube so that it emerges from alongside the handpiece close to the bur. This has many advantages of convenience over the cold water jet.

Surface Application of Cocaine

The upper central incisors can be anæsthetised by placing a swab of 10 per cent cocaine solution on the mucous membrane of the nose overlying their apices. Some men use this technique but the dangers inherent in the use of cocaine solutions should be remembered.

For many years exposed pulps have been anæsthetised by cocaine pressure. The method is only successful when the pulp is first opened so that a small portion of cocaine tablet can be placed in contact with the pulp surface. The tooth cavity is then sealed with unvulcanised rubber and pressure exerted on this so that the cocaine is carried into the pulp tissue. Or the cocaine may be sealed by filling the cavity with wax and pressure exerted on this with a swab of wool. Some pain is felt as the pressure begins but this soon passes and a complete pulp anæsthesia can be secured if the cavity is of suitable shape and there is good access to the pulp exposure. This is a technique worth remembering but it will obviously tend to carry infection from the pulp surface to the apical areas. The body of the pulp cannot be cauterised as it should be before pressure is exerted and this method should be used only as a last resort in cases of difficulty.

Submucous Injections

The injection of local anæsthetic agents into submucous areas has a limited use in conservative dentistry. The chief obstacle is the difficulty of bringing enough anæsthetic fluid in contact with the proper nerve tissue. When this is achieved anæsthesia is always complete. The submucous injection is not a certain way of achieving this although it is the method of choice on occasions. It frequently results in deep anæsthesia of all surrounding structures, i.e. cheek, lips or palate without apparent effect on the dental pulp. If it is to be used the best result is obtained by saturating the area with anæsthetic fluid. The standard 2 c.c. dose of a 2 per cent novocain solution used in dentistry is unnecessarily small. 4 or 5 c.c. may be used with equal safety provided the adrenaline content is low.

The needle should be inserted at the reflection of the mucous membrane and carried to the apex of the tooth, the local anæsthetic being injected slowly all the time.

The upper third and second molars may be successfully anæsthetised by this method but it is simpler to use the posterior dental injection.

The upper first molars should be treated by injecting over each of the three apical areas.

The upper premolars can often be made insensitive by a submucous injection on the buccal side only but, except in the young, it is wiser to infiltrate the palatal area as well.

For the upper canine teeth inject slowly all the way from the reflection of mucous membrane to the apical area. Add a palatal injection after a few moments.

The upper lateral incisor is usually easily anæsthetised by a submucous injection on the labial side but it should be remembered that the apex generally lies below the level of the central incisor and deeper in the bone. The syringe is held at an angle of 45 degrees to the tooth axis. For certainty a palatal injection should be added.

For the upper central incisors the syringe is held parallel to the long axis of the tooth and carried higher than for the lateral incisors. Add a few drops on the palatal side.

Owing to the impervious nature of the mandibular bone it is usually a waste of time to use a submucous injection for pulp anæsthesia in the lower molar and premolar teeth except in the very young.

The lower incisors may be anæsthetised by a labial injection starting near the mucous membrane reflection and carried to the apical area of the lower central incisors. The needle should not be carried too far down as the mandibular bone below the lower incisor apices is very dense.

On the whole the submucous method is at present unsatisfactory because of the uncertainty of the result. It works best in the young for whom there are more suitable techniques available.

A waiting period of several minutes is usually found necessary, always a disadvantage with a nervous patient. The anæsthesia of soft tissues is unpleasant and disliked by many patients. Cocaine solutions are more effective than novocain in the hands of those who use them probably because a smaller amount of solution in contact with nerve tissue will have the desired effect. New anæsthetic solutions of greater potency may make the submucous method more reliable.

Block Anæsthesia

The injection into regional nerve areas is most valuable at times.

The blocking of the inferior dental nerve needs no description as it is so well known, but its result depends on the saturation of the whole nerve tissue and there should be no hesitation in using 4 or 5 c.c. of a 2 per cent novocain solution for this purpose if necessary. This nerve block will not always produce complete pulp anæsthesia of the lower teeth it supplies as would be expected. If it fails the long buccal nerve should be treated by injection at the retromolar fossa on the buccal side of the lower molars (fig. 1) and a submucous injection may be added round the tooth involved.

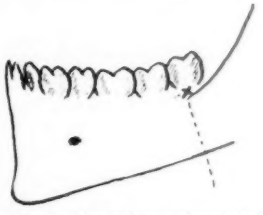

Fig. 1.—Sketch showing site x for injection of long buccal nerve.

The injection around the posterior superior dental nerve is a simple and valuable method to anæsthetise the upper second and third molar teeth. The malar ridge which lies just above the upper second molar tooth should be located and the needle inserted in the mucous membrane fold beneath it. The needle point is kept close to the bone and carried backwards and upwards till it lies over the apical area of the third molar (fig. 2). 2 c.c. of anæsthetic fluid are deposited

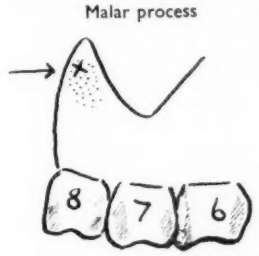

FIG. 2.—Sketch showing spot x to be reached by needle point for injection of posterior dental nerve.

here. Usually anæsthesia is complete in five minutes. An injection into the infraorbital foramen will anæsthetise the pulps of the upper canine and incisors, but it has dangers and discomforts which can be avoided by using the submucous or intra-alveolar techniques.

The lower premolar, canine, and lateral incisor tooth pulps may be made insensitive by an injection into the mental foramen. This normally lies near the apices of the lower premolar teeth. There is a wide variation in its position relative to these teeth but it can usually be felt by the finger tip. After the surface mucous membrane has been anæsthetised the needle point should be passed as nearly as possible into the foramen (fig. 3) and 2 c.c. of

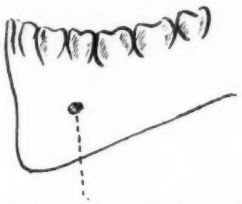

FIG. 3.—Sketch showing approximate position of mental foramen.

solution deposited there. This should be massaged into the foramen.

INTRA-ALVEOLAR INJECTIONS

Injection by the intra-alveolar route is the most useful technique for producing anæsthesia of the dental pulp. This is a well tried method which has been in use for over forty years. I find that although all methods are available, the intra-alveolar route is, in the majority of cases, the safest, most certain and least unpleasant one to use.

The principle is simple.

It consists in piercing the outer plate of alveolar bone to allow a needle to deposit the anæsthetic solution in the porous cancellous tissue which lies between the teeth. The solution passes instantaneously to the periapical tissues and a complete anæsthesia of the pulp is produced.

Although the principle is simple some practice is required before the details of the technique are mastered.

Any syringe may be adapted for this purpose but a nozzle must be used which allows not more than 5 mm. of needle to protrude from the hub (fig. 4).

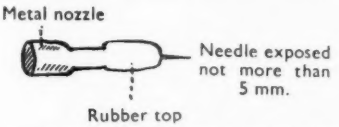

FIG. 4.—Nozzle used for intra-alveolar injection.

A tip of Ash's soft dark rubber (as used for making a soft base to lower dentures) can be vulcanised on any long hub to allow the right length of needle to protrude. This rubber tip can then be pressed against the gum without causing injury. There are many instruments suitable for piercing the outer palate of the alveolus. Among these are: Rosehead bur No. $\frac{1}{2}$, No. 5 Kerrs reamer, No. 3 Beutelrock reamer, reamer shortened to provide piercing point.

The advantage of the last named is the small chance of breakage and easy withdrawal if it does break. The Beutelrock if it breaks leaves a screw point in the bone which can only be removed by freeing it completely. The instrument used for piercing the alveolus should be slightly larger than the syringe needle. A No. 3 Beutelrock reamer may be used with Cottrell's No. 27 needle. 1 c.c. of anæsthetic fluid is drawn into the syringe and a few drops injected into the dental papilla distal to the tooth to be anæsthetised. The best spot for penetrating the alveolus is then chosen and the reamer point pressed on to this. The engine switch is pressed and the reamer passed through the hard outer layer to drop into the cancellous tissue beneath. Keeping an eye fixed on the reamer mark the syringe needle is passed down the hole pierced by the reamer until the hub presses on the gum surface. The hub must form a seal at the gum surface or the solution will leak around its edges instead of being injected into cancellous tissue. The remainder of the solution is then slowly injected. The site for penetration is usually at the middle of the base of the interdental

triangle at a level just below the necks of the neighbouring teeth (figs. 5 and 6).

Usual sites for intra-alveolar injection

FIG. 5.

FIG. 6.—Enlarged radiograph of needle in intra-alveolar injection distal to ⌈3.

To inject the solution usually only needs slight pressure and the effect is marked. Pulsation of the carotids and a slight increase in the rate of breathing usually follow but these general effects quickly subside. An adolescent usually feels a sharp sensation as the apical tissues are reached. This is a sure sign that complete anæsthesia of the dental pulp has been achieved and cavity preparation or removal of the pulp may be undertaken at once with absolute confidence that no pain can be felt. There is no anæsthesia of lips, cheek, tongue or palate except when the solution penetrates to the inferior dental nerve in the mandible and a complete block follows. In any case the solution is so rapidly absorbed that this quickly passes. The anæsthesia lasts about ten minutes and usually includes teeth mesial and distal to the site of injection. The tooth distal to the injection is often only anæsthetised for three or four minutes and should be treated first when both teeth are involved. The time of anæsthesia may be lengthened by increasing the dose or repeating it.

PARODONTAL INJECTION

An injection may be made into the parodontal membrane where the area is accessible and the membrane is healthy. This produces an anæsthesia similar to the intra-alveolar injection and is used by some dental surgeons. It is limited to the mouths in which completely healthy parodontal tissues can be found and the difficulty of sterilising the gingival sulcus through which the needle must be passed. The needle is kept close to the root surface and passed 2 or 3 mm. down the membrane between root and alveolar septum and a very slow injection of solution made from this point.

It is of most use in children and can be regarded as an alternative to the intra-alveolar technique (fig. 7).

FIG. 7.—Position of needle for parodontal injection.

On occasions where other techniques are not a complete success it is possible to complete a pulp anæsthesia in an exposed pulp by injecting into the pulp itself. The body of the pulp should be sterilised if at all possible as the danger of carrying bacteria to the apical area is extreme. The needle is pressed home in the pulp and a seal made in the cavity to prevent the solution leaking back and a slow injection made which effectually completes anæsthesia.

LOCAL ANÆSTHESIA FOR CHILDREN

The choice of local anæsthesia in an individual case will depend on age, condition of the alveolar bone and the patient's personal bias.

From the age of three onwards cavity preparation for filling may be necessary. In treating small children the work is usually confined to treatment of temporary molars and canines. The cutting of dentine in these teeth is not accompanied by much pain and the problem of the difficult child is more one of overcoming fear of strange noises and sights and the placing of instruments in the mouth. Local anæsthesia is rarely needed and sometimes may be more hindrance than help. Cold water jet or spray is often of some assistance but as a rule some form of medication such as $1\frac{1}{2}$ grains of Seconal or even a full general anæsthetic will be the best solution to any real difficulty met with in these cases.

Where it is desirable to destroy the dental pulp in order to save a temporary tooth a local anæsthetic given by the parodontal or intra-alveolar methods is best.

With the eruption of the six-year-old molar tooth the dental problem increases and from 6 years onwards some local anæsthesia may be needed. Usually the period from 6 to 10 years of age may be regarded as one for temporising. It is difficult to do lasting treatment on erupting permanent teeth because of the extreme danger of irritation to the dental pulp via the large damaged dentinal tubules and the problem of keeping a child of this age still long enough to carry out dental operations.

Where it is desirable to complete work and pain prevents adequate preparation, the first molars may be anæsthetised by an injection in the papilla mesial to the tooth and between it and the second temporary molar (fig. 8).

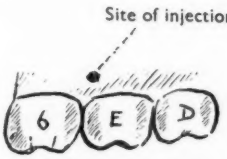

FIG. 8.—Site of injection between first permanent molar and second temporary molar.

The syringe should have a nozzle which will form a seal on the gum margin as for an intra-alveolar injection. When the syringe is pressed home it may have to be rotated until the solution finds a path along which it can be freely injected.

The insertion of the needle must not be made more than about 3 mm. from the gum margin as it will often hit the distal root of the temporary molar which at that age is likely to be in close contact with the first permanent molar.

Injuries occur frequently to this age-group and usually affect the upper incisors.

Pulp removal can be effected painlessly by using submucous injection of a local anæsthetic. A pre-medication dose of 1½ grains of Seconal is a great help in quietening a nervous child.

Local Anæsthesia for Adolescents

The period of adolescence from 10 to 20 years of age is the vital period for conservative dentistry—preventive and remedial. This is the age-group where conservative treatment can be given which will effectively preserve teeth for a long period.

By a rare gift of providence it is also the period where local anæsthesia may be used with almost universal success.

A healthy full interdental papilla and young normal alveolar bone with large cancellous areas make the use of local anæsthesia by the intra-alveolar method nearly ideal. By its use an immediate anæsthesia can be produced in every suitable case.

The adolescent, particularly if unaccustomed to dental treatment, is often highly nervous. The less the growing boy or girl knows of the preparation and the injection of a local anæsthetic the better will be the result. As a rule it should be regarded as part of the cavity preparation and not be discussed. Above all, instruments connected with the injection must be kept out of sight and when convenient prepared before the patient enters the room. It is frequently possible to carry out an intra-alveolar injection without the youngster even being aware what is being done. It is wise to cover the act of inserting the needle point by directing the patient to do some positive action at that precise moment. Opening or closing the mouth or moving towards the needle point are suitable movements. The pain of inserting a sharp needle into the interdental papilla is very slight provided the patient is not anticipating it.

The tall overgrown type of adolescent is very liable to collapse. This is rarely due to the local anæsthetic itself but is the effect of an extra dose of a vaso-constrictor on a patient already loaded with an abnormal dose of his own adrenaline. Abolish pre-operative fear by suggestion or premedication and the result of a local anæsthetic injection will be strikingly different.

Anæsthesia for Adults

From 20 to 50 years of age the need for local anæsthesia by injection lessens. Occlusal cavities except in a few cases can be prepared without much pain with the help of a water jet. Interstitial cavities often need a full anæsthesia in many cases mainly to enable a matrix band to be firmly wedged at the cervical margin. Where the parodontal condition is good the intra-alveolar injection is still the most useful technique but it will become increasingly difficult as age and disease produce changes in the alveolar bone. Sclerosis of the bone in the maxillary alveolus is often sufficiently superficial to allow the intra-alveolar injection at a higher level. This is particularly true of the upper canines. In the mandible cancellous tissue will usually be found in the molar areas.

The lower premolars are often found in middle age to be embedded in a solid mass of compact bone through which no fluid can be passed. In these cases intra-alveolar injection is not possible, and nerve block technique or general analgesia must be used. In choosing the best method in this age-group the bone pathology must be studied. Wherever there is chronic parodontal disease there will be an underlying sclerosed area unsuitable for the insertion

of a needle. A radiograph will be valuable in showing where cancellous tissue may be reached or if bony changes have taken place making intra-alveolar injection unsuitable. Buccal cavities begin to appear and are extremely sensitive to prepare. For these nitrous oxide or trilene analgesia will often be the anæsthetic of choice.

From fifty onwards the closing spaces of the dentinal tubules make cavity preparation in the crown of the tooth less sensitive and usually tolerable without anæsthetic aid. Buccal cavities if in recently exposed cementum will be very painful and will present a real problem in those unsuited to general analgesia. Pulp removal may make local anæsthesia essential. The condition of alveolar bone will often make intra-alveolar injection difficult. The radiographic appearance will usually show whether sufficient cancellous tissue remains to make an intra-alveolar injection possible. If this shows dense bone with bands of thick trabeculæ only a nerve block technique has any chance of being effective.

The canine teeth will usually have an area of cancellous tissue available for an intra-alveolar injection if this is made nearer the apical area than usual.

In old age the changes in dentine and pulp tissue make teeth so insensitive that on occasions it is even possible to ream out a root canal for a post crown without anæsthesia. As in all age-groups conditions in patients vary.

For pulp removal—no other procedure generally requires anæsthesia—it is sometimes necessary to use anæsthesia. Intra-alveolar injection with the site of needle insertion kept near to the apical area or nitrous oxide general analgesia are usually the best methods. Or as bacterial infection at this age is by no means as important as in the young it may be wise to resort to pulp destruction by the older methods of arsenic or cobalt applied to the exposed pulp.

Patients vary enormously in their personal bias to local anæsthesia. Some patients will demand it for every conservative operation ; others refuse it on all occasions. Some will even demand it when pain is impossible, such as working on a pulpless tooth. For these people a submucous injection which paralyses as much soft tissue as possible will be the best policy. If the nervous condition of the patient is relaxed even without pulp anæsthesia being achieved it will serve its purpose. Children raised in a tough environment will tolerate the injection of local anæsthetics which those in gentler circumstances will find unbearable.

The use of local anæsthesia in conservative dentistry has provided an agent more potent for saving teeth than any other single factor. Its use is still restricted by the difficulties found in mouths with unsuitable anatomical or pathological conditions and by the personal prejudice of some patients, but if suitable techniques are chosen for each case and unsuitable cases avoided it does destroy the fear of dentistry which is our greatest hindrance in the effort to preserve healthy natural teeth.

Orthodontic Note

Treatment Considerations for the Loss of Children's Permanent Incisor Teeth

THE eruption of permanent teeth is not a continuous process ; it is divided by a period of rest into two active periods. The first involves the eruption of the first permanent molars and incisors and the second the eruption of canines, premolars, and second molars. The acceleration of growth between the upper canines is greatest from 5 to 8 years of age. Slower steady growth continues until 12 years of age. The width between the lower canines approaches a maximum at 8½ years and from that time little growth occurs in this part of the mouth. The greatest lateral growth in the dental arches occurs in the canine region and the most accelerated growth occurs during the eruption of the permanent incisors. Broadbent reports that the " ugly duckling " stage of dento-facial development reaches its maximum about 10 years of age. The Bolton study records indicate that the apices of all laterals remain converged towards the mid-line of the arches until the jaws increase in size to permit these teeth to take a more upright position. With further development of the face comes increased growth in the sub-nasal area and the upper canines move down, forward and laterally away from the root ends of the laterals. This indicates that until the canines approach their mature positions in the dental arch there is insufficient space at the apical base to permit the roots of the lateral incisors to move into the more vertical normal alignment which is away from the mid-line. Broadbent concludes " to correct the ' ugly duckling ' incisor alignment between 8 and 12 years of age is fraught with hazards that are greater in the under-developed face than in one that is normal for its age." The Bolton clinical records, in all but a few cases, justify the clinician's reluctance to encumber natural developmental forces with mechanical interference during this period of incisor development. During the mixed and early adult dentition periods, when changes in the dental structures are taking place any treatment for the prosthetic replacement of a lost permanent incisor should : protect the health of the remaining teeth and soft tissues ; preserve the occlusion by maintaining spaces and permit individual growth to proceed after prosthetic replacement ; permit the proper evolution of function and speech ; and prevent the development of emotional disturbances. During the transition period a temporary appliance may be constructed to prevent space closure and restore æsthetics without interference with growth and development of the young, changing dentition. The restoration of choice is a fixed bridge replacement with a non-rigid attachment at one end : the final acceptability of such treatment awaits further scientific justification.—HARTSOOK, J. T. (1950) *J. Amer. dent. Assn.*, **40**, 414.

BRITISH DENTAL JOURNAL
AUGUST 4, 1950

REMUNERATION

THE operation of the National Health Service Acts has placed the great majority of members of the healing professions in the position of receiving payment for most of their services directly from the State and only indirectly and impersonally from their patients in their capacity as taxpayers. This change in the traditional relationship of doctor or dentist and patient has been more abrupt in the case of the dental profession than in that of the doctor's. Under the old Health Insurance Acts the latter were under contract with the State to provide general medical treatment for a large proportion of the population whereas, under the schemes of dental benefit, dentists derived a varying proportion of their remuneration directly from their patients, although the fees which were paid were determined by the appropriate regulations. On the other hand, inasmuch as dentists are still paid by fees for each individual item of treatment and general medical practitioners are remunerated under the Health Acts on a capitation basis, the change is greater in their case than it is in that of the dental profession—being one of method as well as of degree. The factor common to both professions is that remuneration is on a flat rate per caput or per operation for all practitioners, whatever may be their respective degrees of skill. A doctor can earn increased remuneration in the general medical service only by increasing the number of patients on his list and a dentist only by performing an increased number of operations.

In the past a professional man, with a successful practice, by raising his fees could both increase his income and, to some extent, regulate the demand on his services. Under the new dispensation the latter aim can only be achieved by a refusal to accept fresh patients—a process in which the doctor is assisted by the limit on the number of patients he may have on his list and the dentist by the imposition of a time limit within which the treatment of each case must be completed. Neither of these methods, however, directly affects the total demand rate and both professions have had to cope with increased calls on their services. Some of these represent the treatment of cases which for economic reasons would previously have gone untreated and it is a matter for congratulation that the Health Service has been the direct means of extending the usefulness of the healing professions by making their services more widely available. If, however, those professions are to be adequately manned to meet the increased calls which are being made on their members it is imperative that the question, or rather questions, of their remuneration should be re-examined in the light of the experience of the past two years and, above all, it is essential that once the basis of remuneration has been agreed it should not be altered by the arbitrary fiat of the Minister.

The Health Service cannot function to the greatest good of the community so long as there is a sense of grievance and discontent among both doctors and dentists about their terms of service. The doctors complain, with every show of reason, that their remuneration has never been properly assessed in view of the new conditions and in relation to the recommendations of the Spens Committee. The extent of their dissatisfaction was amply demonstrated at the Annual Conference of Local Medical Committees in June and at the Annual Representative Meeting of the B.M.A. a fortnight ago when resolutions contemplating wholesale withdrawals from the service were adopted. The root difficulty in the case of both professions lies in the substitution of a fixed scale of payments for the more flexible methods of adjusting remuneration which obtained in private practice in the past. Dental fees were then adjusted to suit the conditions of practice in various parts of the country. They were admittedly based to some extent on the ability or willingness to pay of the clientele of the practice. In many cases fees owed more to custom than to logic, and thanks to the propensity of large sections of the British public to value material things more highly than professional services, those for conservative operations were often relatively unremunerative. It is to the credit of the Health Service that in the original scale of fees an attempt was made to achieve a balance between the two branches of practice. Unfortunately the negotiations were so hurried that there was no

time to assemble sufficient data to form a firm foundation for the calculations on which the scale was based and, although some of the material necessary for a complete review of the scale was collected by the Penman Committee, no further progress has been made. Instead, the Minister of Health has taken unilateral action to alter the scale and so has antagonised the profession at the very time when the success of the Health Service is dependent on the wholehearted co-operation of the profession.

A scale of fees, or a fixed capitation rate, cannot operate with complete justice between one practitioner and another. The most that can be expected of it is that it should give a fair overall remuneration to the profession which, without being extravagantly generous at the expense of the taxpayer, should yet yield an adequate return to the careful conscientious practitioner, working for a reasonable number of hours in the week. The whole picture of dental remuneration has been distorted as a result of the long hours of overtime which many practitioners have felt compelled to work in an endeavour to cope with the demands of the public and, to a lesser extent, by the readiness of some few practitioners to apply methods of mass production to the production of what should be individual appliances designed for each separate case. Before a satisfactory settlement can be reached there will need to be a careful review of all the factors affecting the scale or, alternatively, a complete recasting of the method of remuneration.

NOTES AND COMMENTS

The Medical Act

THE Medical Bill received its Third Reading in the House of Commons on July 21 and is now the Medical Act 1950. Under it every medical student, after a date to be fixed by the Minister of Health, before becoming fully registered, will be required to serve for a period of twelve months in a hospital or other approved institution after passing his final examination. This provision and one authorising the General Medical Council to appoint visitors to medical schools to report on the sufficiency of the courses of instruction were recommended by the Goodenough Committee. This latter provision gave rise to a lively debate in the Commons on the respective responsibilities of the universities and the General Medical Council but in the end there was a general measure of agreement that " if," to quote the Minister of Health, " the institutions work in a common-sense way friction ought not to arise." The Act is of special interest to the dental profession since it is probable that any Bill to amend the Dentists Acts, in addition to enlarging the constitution of the Dental Board and extending its powers, will contain provisions with respect to the disciplinary procedure of the Board similar to those which have been accepted as applicable to the medical profession.

J.A.D.A. Mid-century Issue

THIS special issue of the *Journal of the American Dental Association* may produce a shock in the reader when he realises the immense changes which have occurred during the last fifty years and all that has happened in them. The century began with a war which was ending but leaving embers to be fanned into fiercer flame. Two world wars came in which America played a part. The many startling discoveries which have revolutionised dental practice are reviewed department by department, beginning with that of research. Especial mention is made of the research which has arisen from the work of McKay and Black on mottled enamel, which already has had far-reaching effects on dental practice, and holds the promise of bringing the prevention of dental caries a stage nearer. There is now no school of dentistry in the U.S.A. which has not a research department, whereas fifty years ago research was a matter of individual interest. This development is illustrated by a table in which the research activities of the last decade of the nineteenth century are contrasted with those undertaken in the 1940's. The important part played by periodical literature as an aid to research is well brought out in the account of the *Journal of the Allied Societies* and its subsequent merger into the *Journal of Dental Research*. The recital of the noteworthy advances which have been made in diagnosis and treatment planning would astonish the leaders of fifty years ago—the systemic relationship of dental disease to systemic disease, focal infection, the cancer problem, chemistry of materials, bacteriology and, above all, radiology and all its implications are examples of these advances. This review is supplemented by an extensive and excellent bibliography. Startling as all this progress must be to those who are able to look back and remember, that which has been made in the field of dental education must be even more so. The comparison of the schools, even those splendid ones in the States, then and now shows what the modern student has to face before obtaining a diploma ; while equipment, surroundings and technique have become what seem to the observer to be ideal, yet there is no knowing how

soon even these will be out of date. Each subject has become so intricate that it seems impossible for one mind to master all the details, and an increase in specialisation seems inevitable. It is comforting to turn from these disturbing thoughts to the section dealing with notable contributors, for here at once friendly and comforting faces smile from the pages. There is the welcoming smile and genial handclasp of C. N. Johnson, Edward Kirk, Leon Williams, J. B. Robinson and M. H. Cryer. The old house of the A.D.A. has a friendly air, quite other than the new building in spite of the latter's more commodious and efficient aspect. The great organisations for public health, especially for children, are reviewed, and there are reminders of the beneficence of Eastman with his many clinics for children sponsored by the stalwart Burkhart. The international touch is not wanting, and there are photographs of the presentation of the Miller Prize, with Henri Villain and A. E. Rowlett, the latter presenting the Prize to Mrs. La Chance, posthumously presented for her father, the late W. G. Logan. Lastly, there is an account of the great advance which has been made in dental literature, especially in periodicals which have multiplied during the period under review. As usual, America has given a lead, and it is natural that this volume should confine itself to the half century as it affects that country.

Diamond Discs and Points

DIAMOND points and discs once used by the few are now becoming general for cavity preparation in this age of speed. At least fifty years ago William Dall demonstrated their value for cavity preparation, he made these discs himself and showed members at annual meetings how this could be done. There are two varieties, "bort" and "carbonado," the former for discs, burs, points and diamond files, the latter, which is harder, is for making drills and truing instruments. The discs are made of hard rolled copper $\frac{1}{50}$ mm. in thickness; complaints against these discs when investigated proved, more often than not, that the fault was with the operator, who probably had pushed them and not "allowed them to feed themselves." When the discs become uneven they can be trued, "the edges thinned at the cutting edge in the dental engine or by the aid of a fine file." A disc can be made useful when worn by alternating the sides and thus sharpening the edges. Boiling in H_2SO_4 for half a minute sharpens the disc if the sides are well charged. The equipment used by Dall for making these discs and points is to be seen in the Smith Turner museum at Headquarters.

Fifty Years Ago

From the "Journal of the British Dental Association," August 15, 1900

If there could have been any doubt as to the success of the International Dental Congress it is now at an end; for although the proceedings have not arrived at their conclusion as these lines are being written, yet the meetings—both social and professional—which have already taken place have in themselves afforded ample evidence, to all who have had the good fortune to attend them, that the art and science of dentistry are not the peculiar products of any single nation, or of any two or three nations, but are cosmopolitan. The universal spirit of professional brotherhood has been exemplified at this Congress to a larger extent than could have been expected, and in proof of the interest which is taken by dentists all the world over in the advancement of their profession it is sufficient to say that at the opening meeting of the Congress, which took place in the Palais des Congrés, in the Exhibition grounds, on the morning of Wednesday, August 8, the Treasurer, M. Viau, made the gratifying announcement that the number of members amount to 1,150, a higher figure than had ever before been attained.

LETTERS TO THE EDITOR

THE ANNUAL MEETING

SIR,—I wish to thank every one who contributed to making the recent Annual General Meeting in Birmingham such a happy event.

Success on such an occasion depends entirely upon complete co-operation between Headquarters and the Branch Organising Committee.

Lecturers and demonstrators gave us excellent fare and the many members who attended all combined to make what I hope was a successful meeting.

43a, *Calthorpe Road,*
Five Ways,
Birmingham, 15.

Yours sincerely,
H. T. ROPER-HALL,
President.

SIR,—Now the 70th Annual Meeting of the British Dental Association held in Birmingham has terminated, on behalf of the Organising Committee of the Central Counties Branch, I should like to thank all those who helped in any way to make the meeting a success. The Birmingham University in its splendid surroundings was a very fitting centre for the social activities; the medical school could not have been bettered for the display of films, demonstrations and clinical cases and the use of the Board room at the Queen Elizabeth Hospital was very much appreciated. To those authorities to whom we are indebted for the loan of these buildings and the facilities they offered we offer our most grateful thanks. This was our first amalgamated meeting and I hope that those who have just joined us will be justly proud of their new Association.

Yours faithfully,
NORMAN HAINES,
Chairman Organising Committee.

SIR,—At the close of a memorable week of the 70th Annual Meeting of the B.D.A., and attending for the first time as a member of the new amalgamated body, I would like to express my admiration and thanks to the Central Counties Branch for the wonderful programme and arrangements made.

The setting for the meeting in the beautiful University with its lovely approach and surroundings is something which I cannot imagine will ever be surpassed wherever the Annual Meeting be held in the future.

The lavish hospitality of that wonderful Monday evening function I shall long remember with pleasure, the setting for the Annual Dinner on Wednesday in that beautiful Hall was magnificent, and the friendly atmosphere during the whole meeting augurs well for the future. This is but a poor attempt to express my feelings, but is at least a sincere appreciation from one attending a B.D.A. Annual Meeting for the first, and I hope not the last, time.

Yours faithfully,

387, *Cheetham Hill Road*, F. SUTCLIFFE.
Manchester, 8.

THE PILTDOWN SKULL

SIR,—In reply to Mr. Marston, I had not overlooked the fact that a list of Holocene (Recent) material had been included in the analysis of fossil materials from Piltdown. I objected to Mr. Marston's paper in the BRITISH DENTAL JOURNAL because he sought to compare the fluorine content of specimens from widely separated localities without indicating that Drs. Oakley and Hoskins had made certain important reservations on the validity of such comparisons. Furthermore, they also state that the comparison of fluorine values alone can be definitely misleading since a variable amount of silt may contaminate the samples used for the analyses ; to make a valid comparison, the values used for each specimen should be the percentage ratio of fluorine to phosphate (as P_2O_5), otherwise the fluorine content may be too low if expressed as percentage ratio of the weight of sample. Again, they point out that specimens compared must have similar matrices.

I also question Mr Marston's statement that the published data of Oakley and Hoskins shows that the fluorine content of the Piltdown skull and mandible is of the same low percentage as that of the Piltdown Holocene (Recent) material. The relevant material having fluorine values in the range 0·1 to 0·3 per cent has been divided by Oakley and Hoskins into two groups : Holocene or Pleistocene and Holocene (Recent). It would appear that the published data indicates that there is some doubt as to whether this range of values belongs to Pleistocene or Holocene (Recent) ages.

For the above reasons, therefore, I am unable to agree that my objections to Mr. Marston's paper are ill founded.

Department of Zoology, Yours faithfully,
King's College, P. H. STAPLE,
University of London, Nuffield Dental Research
*Strand, W.C.*2. Fellow.

FLUORINE THERAPY

SIR,—No superficial treatment of the surface of the enamel with fluorine can be equal to the ingestion of fluorine into the blood stream from within. Coarse cereals and sea foods are said to provide fluorine atoms and therefore during the first seven years of a child's life these cereals should be given. At the Annual Meeting of the Association we ought to have had the whole morning to discuss Mr. Leatherman's excellent paper on ancillary services.

It must be clear, after fifty years' propaganda work, that we shall make no headway against dental disease until we call in the help of women. Their work must begin at the ante-natal clinic and the mothers must be instructed, and watched, about dieting until the child is 7 years of age. The child should be inspected at the age of 12 months and thereafter every six or twelve months until the age of 7 years when a dental surgeon might take charge. The slightest sign of decay should be treated at once but there will not be any decay if the child is given coarse oatmeal and milk and there is moderation in the use of sugary foods.

7 *de Parys Avenue*, Yours faithfully,
Bedford. C. N. PEACOCK.

MANDIBULAR OSTEOTOMY

SIR,—Mr. T. Cradock Henry's communication on a case of mandibular osteotomy raises the important question of deciding on the most suitable age for operation. Recent reports on relapses after Kostecka's operation are mostly from those who operate at an early age, this means before the normal growth of the jaws has ceased.

At a visit to Kostecka's Clinic, we had the opportunity of discussing this point with him and found too that he is very hesitant to undertake a bilateral osteotomy before the age of 21, particularly in cases of clefts where there is a marked inhibited growth of the maxilla (partly due to early and extensive surgical treatment) and the danger of relapse is very high. The osteotomy does not interfere with further growth of the mandible, and adjusting the lower jaw to an upper under-developed arch at this age will give a good functional result for a limited period. It is very likely that the mandible will soon outgrow the maxilla in its further growth and so lead to a relapse. This particularly in a case where there is a loss of a number of cheek teeth with reduced interlocking of the cusps. Even in cases operated on after the age of 20, we are using a Norwegian plate for at least a year to reduce the danger of relapse.

In younger cases, as described by Mr. Cradock Henry, we are of the opinion that, even in spite of this precaution, the further uneven growth and development of the jaws cannot be controlled and a relapse will occur.

For these reasons, we are hesitant to advise osteotomy of the mandible in cases of mandibular protrusion before the time growth has completely ceased, however strong arguments and pressure from the patient and parents may be.

Dental Department of Yours faithfully,
University College Hospital W. GROSSMANN.
(*National Dental Hospital*), C. DE VERE GREEN.
Great Portland Street,
*London, W.*1.

EXTRACTED TEETH WANTED

SIR,—The Institute of Dental Surgery is anxious to build up a stock of extracted teeth for phantom head work, models and other teaching purposes.

May I appeal, through the columns of your Journal, for the help of practitioners, especially those in central London, in creating a supply of teeth for the Institute.

Both carious and non-carious permanent teeth are required, the only necessity being that they should not be allowed to dry out.

The Institute will defray expenses on any teeth sent by post or arrange to collect larger quantities in the central London area. Teeth sent by post should be in an antiseptic solution in a stoppered jar, or kept damp with gauze, or some similar material, in an airtight tin.

Yours faithfully,

GUY A. MORRANT,
Lecturer and Head of the Department of Conservative Dentistry.
British Postgraduate Medical Federation,
Institute of Dental Surgery,
Eastman Dental Hospital,
*Gray's Inn Road, London, W.C.*1.

REVIEWS AND ABSTRACTS

THE ACRYLIC PLASTICS IN DENTISTRY. By Jacob R. Schwartz, D.D.S. Member A.S.T.P. American Society for Testing Materials. Dental Items of Interest Publishing Company Inc. Brooklyn, New York. Pp. 447. Price 84s.

Despite its title this book is by no means restricted to the acrylic resins alone, and its early chapters are devoted to an interesting consideration of the history, physical properties and chemistry of the more important plastics which have been and are being used in dentistry, for example, the cellulose and vinyl resins. The failings of the earlier bases and the superiority of the most important present-day material—acrylic resin—are clearly shown.

The section on the chemistry of plastics, and in fact the presentation of chemistry throughout the book in general is rather unsatisfactory, especially the chemical formulæ which are badly presented in an unorthodox manner such that they often seem misleading and occasionally inaccurate.

After dealing with the moulding and processing of plastics by both industrial and dental methods the book goes on to present what might be described as the "Schwartz Technique" for the application of acrylic resin to conservative and prosthetic dentistry, with particular reference to acrylic jacket crowns with and without gold hoods and precision abutment slots. This section is well presented, the procedures being set out in step-by-step stages assisted by a host of illustrations, and concluding with a series of practical cases in which the application of the above principles is demonstrated.

The book concludes with a bibliography and an extensive glossary of terms met with in the field of plastics. The glossary unfortunately contains many inaccuracies, particularly again in chemistry, and is by no means a satisfactory source of reference.

New Evidence on the Antiquity of Piltdown Man.—This is an account of an investigation, using the fluorine method for the determination of the relative antiquity of fossil bones, which was carried out under the auspices of the British Museum, to try and settle the controversy which has raged ever since the discovery, in 1913, of some thick but essentially human cranial bones in close proximity to a remarkably ape-like mandible and canine tooth in gravel at Piltdown. The points at issue were: what was the age of the remains, whether the cranium and mandible belonged to the same creature, and if not, to what age was each to be assigned. Further to complicate the issue, the Piltdown gravel contained fossil mammals of two distinct ages: a derived Villafranchian series, "Upper Pliocene" of earlier authors, now classed as Lower Pleistocene, and a later Pleistocene group, in part, at least, contemporary with the gravel.

At the time of the discovery, Sir A. Smith Woodward described the remains as a new genus and species of man, Eoanthropus dawsoni. Two diametrically opposed views came to be held as to the age of the remains: one school regarded the mandible and canine tooth as anthropoid and placed it with the Villafranchian group, dismissing the cranium as later Pleistocene and referable to *Homo sapiens*. In recent years it has been held that so long as its date remained uncertain, the material was better placed in a suspense account, since the anatomical features of Eoanthropus (assuming the material to represent one creature) were wholly unlike what the discoveries in the Far East and Africa have since led us to expect in an early Pleistocene hominid (Clark, W. E. Le Gros (1948) *Nature Lond.*, **161**, 667). The present investigation has shown that the cranial bones and mandible are of the same age, at the earliest Middle, more probably early Upper, Pleistocene. The fluorine-dating method is based on the following principles. Fossil bones (and teeth) accumulate fluorine in course of time due to their hydroxyapatite which acts as a natural trap for fluorine derived from ground water. By a process of ionic interchange, fluorine becomes "fixed" in bone substance as fluorapatite. Owing to the porous nature of the material, this reaction proceeds more or less uniformly throughout the body of the material. By determination of the amount of fluorine of indigenous fossil bones in the same strata, a standard is made available with which the fluorine content of the bones whose age is required may be compared. In specimens with similar matrices, the amount of fluorine varies with the length of time the specimen has been in the ground, but the method cannot be used to compare bones from widely separated localities. By developing an analysis technique capable of exact determination of minute amounts of fluorine, it was possible to estimate the fluorine present in very small samples of bone and thus only minimal damage resulted to the specimens. For most of the estimations 20 mg. of sample were used, but in several cases it was only possible to obtain 5 mg. With weights of 5 mg. and upwards, it is known that the accuracy is within $\pm$ 0·1 per cent of fluorine. As applied to the Piltdown material the procedure was as follows: Every available bone and tooth

from the Piltdown gravel and from the neighbouring deposits was analysed including 17 samples of the Eoanthropus material. Samples were taken from broken or worn edges of the specimens using a dental drill until sufficient powder had been cored out; where possible, powder from several holes was mixed to obtain representative samples. Since porous bones may be contaminated with silt, the fluorine content per unit weight of specimen will be misleadingly low unless some correction is made for this contamination, phosphate determinations were therefore made on all samples and the fluorine value expressed as the percentage ratio of fluorine to phosphate (as P_2O_5). As a result of these analyses, it became evident that there was no significant difference between the rate of fluorine absorption by bone and dentine but that enamel was more resistant to absorption of fluorine than dentine. Finally, it was established as a result of the comparisons between the fluorine values of specimens attributed to Eoanthropus with bones and teeth of specimens of known geological ages that all the specimens of Eoanthropus, including the remains of a second skull found 2 miles away, were contemporaneous and should be attributed, at the earliest, to Middle Pleistocene.—OAKLEY, K. P., and HOSKINS, C. R. (1950) *Nature Lond.*, **165,** 379.

The Architectural Pattern of the Boundary between Epithelium and Connective Tissue of the Gingiva in the Rhesus Monkey.—In order to study the three-dimensional pattern of the complicated surface between the epithelium and connective tissue in mucous membrane in various parts of the mouth of the rhesus monkey, 60 biopsy specimens were obtained from 12 monkeys and specimens were also obtained post mortem from 2 other monkeys. The method of examination adopted was to dissect off the epithelium from the lamina propria after maceration in dilute acetic acid and then to study the under surface of the epithelium by means of a dissecting microscope. In the case of the loosely attached alveolar mucosa the connective tissue presented a fairly flat surface and contained low, regularly spaced, parallel ridges surmounted by conical papillæ and running mainly in a vertical direction. The papillæ numbered approximately 110 per square millimetre. At the mucogingival junction there was an abrupt change; in the gingiva the papillæ of connective tissue were larger and wider and more numerous and were usually connected by low ridges running more or less vertically—so that the papillæ appeared as if arranged in rows. Some papillæ were branched. As the gingival margin was approached, the papillæ, instead of projecting at right-angles to the lamina propria, inclined towards the margin and at the margin itself the ridges became more pronounced and changed direction to run parallel to the margin. The papillæ surmounting these ridges were small and sometimes absent for short distances. No change in the boundary between epithelium and connective tissue occurred at the position of the free gingival groove when clinical signs of inflammation were absent. Contrary to the usual statement that the boundary between the normal epithelial attachment and the connective tissue is flat and free of peg formation, ridges were found in the epithelial attachment, except in its most apical portion. In the region of the crest of the interdental papillæ the main epithelial ridges sometimes formed a whorl. The ridges of the palatal mucosa were closely set and short and ran mostly at right-angles to the palatal rugæ. Short conical papillæ projected from the crests of the ridges. All the animals showed some inflammation of the interdental papillæ between the upper central incisors and at these sites the epithelial ridges had proliferated. Serial sections of specimens of the mucous membrane cut at various angles showed that the appearance of ridges might simulate broad, narrow, short or long "pegs" according to the obliquity of the cross-section.—EMSLIE, R. D., and WEINMANN, J. P. (1949) *Anat. Rec.*, **105,** 35.

Osteoradionecrosis of the Jaws.—A man of 58 years presented three years after excision of a squamous cell carcinoma of the right tonsillar fossa followed by deep X-ray therapy and radium implantation. There was a post-irradiational inflammation of the oral mucosa, angular cheilitis and extensive dental caries. Radiographs showed apical abscesses. He was admitted to hospital and total extractions carried out in quadrants under general anæsthesia. Penicillin was given prophylactically. Healing occurred normally but two months later he developed an area of bone necrosis in the region of the lower right third molar. This increased in size and extensive sloughing of mucosa and a pathological fracture occurred. He was again admitted to hospital and, after an initial operation for ligation of the external carotid artery, the right mandible was resected intra-orally. Iodoform gauze was inserted into the wound and was gradually removed during the next month as the cavity filled with granulation tissue. He gained weight rapidly, was free from pain and deformity was very slight.—LA DOW, C. S. (1950) *Oral Surg.*, **3,** 582.

Heat Treatment of Raw Meat and Milk.—In California a series of experiments have been undertaken on cats to compare the effect of raw and cooked meat and milk on growth and reproduction. Generation after generation remained healthy fed on the raw foods, while those fed on cooked meat and processed milk, although receiving cod-liver oil, became progressively degenerate. At the conclusion of the experiments the pens were allowed to lie fallow for several weeks. The weeds which sprang up were luxurious in the pens in which the cats had been fed on the raw diet while in the other pens the weeds were weak. Beans were then planted in the pens with comparable results. It seems that ordinary cooking precipitates proteins rendering them indigestible. These experiments, it would seem, support the conclusions of Professor Sprawson as to the value of raw milk for children.—POTTENGER, F. M., jr. (1946) *Amer. J. Orthodont.*, **32,** Oral Surg. 467. (Abstracted in (1949–50) *Mother Earth*, **4,** 35.)

Acrylic Resins : An Appraisal of Their Use in Dentistry.—Methyl methacrylate resin is the best material so far produced for use as a denture base material. In processing, it is necessary slightly to overfill the mould, and have several trial closures. In this way porosity and pitting are avoided, while a thick flash is prevented, which would increase the vertical dimension. One point in favour of injection moulding as opposed to compression moulding is that the vertical dimension cannot be increased. The swelling of the resin due to absorption of water tends to compensate the curing

shrinkage, but it is to be remembered that this shrinkage is not uniform throughout the denture. A recent series of experiments confirmed that no denture studied returned to its original posterior dimension when immersed in water. The warpage varied from 0·15 to 0·72 per cent. Clinically, such dimensional instability is tolerated, but an improved material in this respect would also aid clinical standards. In rebasing, and repairing, the curing temperature should be kept below 75° C. in order that the processing strains introduced during the first processing are not released. At this low temperature, the heat must be applied for a long time to get maximum strength. It is suggested that the flasked denture should be kept at 65° to 70° C. (150°–160° F.) for nine hours. In conservative technique, metal backings and reinforcements should be used with acrylic resins to prevent leakage and distortion. Warpage may seem to be tolerated by the soft tissues but it is not by the hard tissues, and leakage results at the edges of fillings. From the point of view of attrition, the abrasion resistance of acrylic resin is less than that of pure gold, and the latter is considered too soft for use in inlay work.—SKINNER, E. W. (1949) *J. Amer. dent. Ass.*, **39**, 261.

THE HEALTH SERVICE

SERVICE COMMITTEES—AMENDING REGULATIONS

THE Minister of Health has recently made the National Health Service (Service Committees and Tribunal) Amendment Regulations 1950 (S.I. 1950 No. 983). The purpose of many of the new Regulations is to clarify points in the 1948 Regulations (S.I. 1948 No. 507) but one or two new matters are also dealt with.

Executive Councils are given power to establish two or more Medical, Dental or Pharmaceutical Service Committees, with the consent of the Minister. According to E.C.L. 70/50 the purpose of this provision is to enable cases to be dealt with without undue delay.

Where a deputy chairman of a Service Committee attends a hearing at which the chairman also is present, he will not henceforward be entitled to take any part in the proceedings. This is in order to avoid upsetting the balance between lay and professional representation on the Committee.

Under the 1948 Regulations the Local Dental Committee was entitled to be represented at service committee hearings only by its "secretary or other officer." In future a duly authorised member of the Local Dental Committee will have the right to attend in place of the Secretary or officer.

Where a complaint against a dentist concerns the conduct of his deputy or assistant the Clerk of the Executive Council must now send a copy of the complaint to the deputy or assistant. If the deputy or assistant makes application to the Service Committee within 14 days of receiving the complaint, he has the right to be treated as a party to the proceedings, that is to have copies of all relevant documents, to attend the hearing, to be assisted in the presentation of his case, to produce evidence, and to call his own witness and question the complainant and his witnesses.

The Executive Council will, however, have no power to award any penalty of any kind against the deputy or assistant in such a case, and the deputy or assistant is given no right of appeal against the Executive Council's decision on the report of the Service Committee.

QUESTIONS IN PARLIAMENT

Emergency Cases.—Sir W. Darling (*Edinburgh South*) asked the Minister of Health if he was aware of the case in which an Edinburgh citizen, a contributor to the National Health Service, while engaged on public business in London, broke a tooth and damaged spectacles ; what arrangements were made for emergency treatment of such cases ; and if he would make a statement as to emergency health services generally.

The Parliamentary Secretary to the Ministry (Mr. Blenkinsop) said that he could not identify the particular case, but application for emergency dental treatment or for the repair of spectacles could be made direct to any dentist (or hospital with dental facilities) or optician and special administrative arrangements had been designed to enable such cases to be dealt with quickly.

Mr. Higgs asked the Minister of Health what was the correct procedure advised by him under the Health Scheme for a person suffering from acute toothache who was unable to obtain immediate attention from a dentist ; and to what authority an appeal could be made in such cases of emergency.

Mr. Bevan replied that in most areas dentists set aside stated times for emergency cases. The clerk to the Executive Council should also be able to help in cases of need.

Dental Technicians (Fair Wages Clause).—In reply to a question by Mr. Baird (*Wolverhampton East*) the Minister of Health in a written reply said that the fair wages clause in the National Health Service (General Dental Services) Regulations did not apply to dental technicians employed by dental laboratories.

Dental News

THIRD WORLD HEALTH ASSEMBLY

Dental Hygiene

THE Third World Health Assembly of the World Health Organisation (WHO) at their meeting in Geneva adopted a resolution on dental health problems put forward by Surgeon General L. A. Scheele of the U.S. Public Health Service in co-operation with the American Dental Association. The resolution was as follows :—

" Whereas dental diseases are universal and affect adversely the health and efficiency of millions of individuals throughout the world ;

" Whereas a study of these conditions on a world-wide basis may contribute to a better understanding of factors such as malnutrition underlying dental diseases ; and

" Whereas the application of known preventive and corrective measures designed to prevent, correct, or eliminate dental diseases appears eminently desirable ;

" The Third World Health Assembly

(1) Requests the Executive Board and the Director-General to study the problem of dental health with a view to presenting a programme in this field for consideration by the Fourth World Health Assembly, and

(2) Calls on all research institutes concerned with the problem of dental health to collaborate with WHO in the study of this problem."

Mr. A. E. Rowlett, in a statement supporting the resolution, said that Dr. Jaccard and himself as delegates

of the International Dental Federation wholeheartedly supported the resolution, which, he said, would bring to the notice of the World Health Assembly the views originally expressed in the Programme Committee of the First World Health Assembly which had been expanded in a preliminary report by Dr. Jaccard in 1948 and by himself in a final report in 1949. The value of the proposal of the Delegation of United States was self-evident.

The Third World Health Assembly also gave approval to the programme for Health Education of the public as contained in the proposed programme and Budget estimates for 1951 (*Off. Rec. World Hlth. Org.*, **23**, 104–105).

ARPA INTERNATIONAL

THE 12th Congress of Arpa International is to be held in Madrid from March 13 to 18, 1951. The first three days of the Congress will be devoted to scientific papers, discussions and films. Committees of Spanish Arpa and the Spanish Stomatological Society are arranging visits to the Escurial and to Toledo on March 16 and 17 respectively, and the official dinner of the Congress will take place on Saturday, March 17. Communications with respect to papers to be given at the Congress should be addressed to Professor A. J. Held, Institut de Medecine dentaire de Geneve, rue Micheli du Crest 43, Geneva.

ANNUAL DINNER OF THE ASSOCIATION

THE Annual Dinner of the British Dental Association was held in the Great Hall of the University, Birmingham, on Wednesday, July 12, 1950. Mr. H. T. Roper-Hall, President of the Association, occupied the chair, and more than five hundred members and guests were present.

The loyal toast having been honoured, Lord WEBB JOHNSON, proposed the toast of " The City of Birmingham." He had always admired, he said, the resilience of Birmingham in meeting the calls made upon it from any part of the world, and in his travels about the world he had seldom failed to find, either as a modern production or as a representation of some article of great antiquity, something which originated in Birmingham. (*Laughter.*)

He had always been a great admirer of the pioneer work done in Birmingham in industry, in health, in town planning and in hospitals. There would be many who would share his deep regret that the great local authorities were no longer responsible for a large part of the hospital service of the country. (*Applause.*)

Cities and countries should be proud of those who had contributed to the benefit of mankind in the medical profession, and Birmingham could claim some of the greatest names in the history of British surgery. The name of Lawson Tait would live for ever, but he had found no memorial to him in Birmingham. Furneaux Jordan was a great pioneer, and his son a great gynæcologist. The father of the present Professor of Dental Surgery of Birmingham was one of the most distinguished dental anatomists of all time, while the present President of the B.D.A., a Birmingham man, was amongst the leaders in a very great profession.

The LORD MAYOR OF BIRMINGHAM (Alderman A. Paddon-Smith), who responded, said that Birmingham was celebrated as " the city of a thousand trades," and the actual number to-day was 1,248, but did not include, for some reason which he did not understand, the manufacture of the equipment and implements used by the dental profession.

The toast of " The University of Birmingham " was proposed by Professor R. BRADLAW, who said that Anatole France had said that to digest learning one must have appetite, and the universities of Great Britain had tried to whet that appetite. Originality lay not in thinking differently from others but in thinking for oneself. British universities did train students to think for themselves, and that was a guarantee of continuing freedom; so long as men and women thought for themselves there need be no fear of the future.

Many famous names in dentistry were associated with Birmingham, including those of Humphreys, Wellings, Round, Broderick and Roper-Hall. There were now 3,500 undergraduates at the University, compared with 1,500 before the war, and 200 dental students compared with a pre-war average of 90. The dental school was one of the finest in this country. Such progress would not have been possible without the enthusiasm and devotion of such men as Professor Humphreys, the Vice-Principal, and Mr. Sydney Vernon, the Pro-Chancellor. (*Applause.*)

Mr. SYDNEY VERNON, Pro-Chancellor of the University of Birmingham, in responding, expressed his admiration for the achievements of the dental profession and said he did not know that any branch of medicine had made such great strides in the last generation as had been made by the dentists. An American had recently described England as a country of " weeping and wailing and nationalisation of teeth." (*Laughter.*) He gathered that there was a certain amount of feeling on that point among the members of the dental profession.

Professor A. B. P. AMIES, Dean of the Faculty of Dental Science, University of Melbourne, who proposed the toast of " The British Dental Association," said he was very sensible of the honour of being asked to do so on such an historic occasion, now that the members of the dental profession had come together in one great Association. If the fundamental ideals of any branch of the healing art were to remain unimpaired in spite of intense and political and economic strain, not only must there be a fervent belief in those ideals but everything possible must be done to protect them and keep them alive, because otherwise a vital part of our British way of life would perish with them. It was no exaggeration to say that the British Dental Association represented a great barrier against those extraneous influences which might otherwise strain their ideals and ethics beyond the breaking point.

" The years which follow great social upheavals," he said, " are always years of fluctuating moral values, and today the aftermath of war and the sensational progress of science induces in the minds of young people a feeling of uncertainty about those conceptions of right and wrong which our forefathers regarded as unchanging. It is therefore more important than ever before, that every possible reinforcement should be furnished to those things which make for good in the community. Such reinforcement can be supplied by groups of persons who are bound to observe the highest standards of conduct and who are united in an obligation to give, in material things, at least a little more to the community than they expect to get from it. Such a group of persons is the British Dental Association. It faces a most difficult

immediate future, but, with the strength which it has recently gathered, I am confident that it is capable of steering the ship of destiny of the dental profession to waters of wisdom, integrity and pride." (*Applause.*)

Mr. T. HINDLE, Vice-Chairman of the Representative Board, thanked Professor Amies for bringing such an encouraging message from the other side of the world, from a continent which the people of Britain dearly loved ; they were very proud of the fact that Australia was a part of the Commonwealth. (*Applause.*) He did not know whether there was a Minister of Health in Australia, but if there was it was to be hoped that he did not occupy so much of the time of the dental organisation there as was the case in this country. (*Laughter.*) " In this country," Mr. Hindle remarked, " some of us have had to meet this gentleman so frequently that I understand they have even come to address him by his Christian name, and I have heard it said that the profession in this country is 'Nye' ruined." (*Laughter.*)

This was a unique occasion because it was the first Annual Dinner of the newly-constituted amalgamated British Dental Association. (*Applause.*) This was the seventieth Annual Meeting of the British Dental Association which was a proud record. The Incorporated Dental Society had a record of nearly sixty years. Those two societies and the Public Dental Service Association brought with them traditions and memories but they also brought with them in some hearts a feeling of sadness at the loss of certain landmarks. To recompense them for that they had joy in the achievement of a great ideal, the great ideal which they were celebrating that night. (*Applause.*)

" I am responding to this toast," he said, " for and on behalf of those three organisations and all those gallant men who have built up the position which exists today. We now hope to receive the benefit of the enthusiasm, the ideals and the faith of some of those men, and to build on the great ideals of men such as Tomes, Guy, Bennett and Lindsay in the British Dental Association ; Bowen, Butterfield, Tattersall, Condry and our Secretary Parker Buchanan in the Incorporated Dental Society ; and in the Public Dental Service Association, Attkins, Dykes, and our present President, Mr. Roper-Hall. They have given us a solid basis on which to work out our future. We have a duty to do of which we are very conscious, and the best way in which we can honour this toast is to show individually our pride in and our loyalty to this new amalgamated British Dental Association." (*Applause.*)

Professor H. HUMPHREYS, Vice-Principal, University of Birmingham, proposed the toast of " The Guests." The Association, he said, was delighted to welcome many guests associated with the City and University of Birmingham, leaders of the profession from the United States of America, Australia, Ireland, India, Malaya and Malta, the heads of the Dental Services of all three Defence Departments, and distinguished representatives of the Ministry of Health, the Royal College of Surgeons and the Dental Board.

" Why has this meeting been brought about ? " he asked. " What do we expect to get from it ? Why has a record number of members of the Association come to Birmingham? " " I believe," he said," that they have come to improve the standard of their knowledge and experience, so that we may raise the standards of our work and improve the quality of the services which we can render to the community. It is only in this way that we can increase the esteem in which our profession is held and enrich our lives by the most profound of all satisfactions, the sense that we have put into life more than we have got out of it." (*Applause.*)

Lt.-General Sir NEIL CANTLIE, Director-General, Army Medical Services, responding on behalf of the guests, said he welcomed the opportunity of paying tribute to two distinguished members of the dental profession. One was Brigadier Broderick, whom he would like to thank for his service for five years as consultant to the Army, and the other was Professor Humphreys, who had given very long and distinguished service in the Territorial Army. He would also like to express his gratitude to his old friend Major-General Higgins, who had a very wide experience of the dental services in peace and in war.

The Dental and Medical Services played a great part during the war, and he would like to thank the dental profession for all that they did at that time ; in orthodontic work and in curing maxillo-facial injuries they made a big contribution to the morale of the Services. (*Applause.*)

The toast of " The Chairman " was proposed by Mr. NORMAN HAINES, President of the Central Counties Branch, who said that members in Birmingham had watched with increasing pride and interest the rise of Mr. Roper-Hall to the eminent position which he occupied today. (*Applause.*) He was a man of unflagging energy, and had found time to devote a great deal of thought to matters politically affecting the profession, to act as adviser to those controlling the destinies of dentistry, to travel, to undertake research work, and to create and maintain innumerable friendships, and with all those activities he remained approachable by all. The Association was fortunate in having at its head in these revolutionary days someone with the energy, the personality and the wisdom of Mr. Roper-Hall. (*Applause.*)

" For seventy years," he said, " the British Dental Association has not represented the whole of the dental profession. Today we are united, and Mr. Roper-Hall must be very proud to be the first President of our amalgamated organisation." (*Applause.*) " We all know how much easier a task is when one is assisted by a wife whose interests are those of her husband. Mr. Roper-Hall is fortunate in having such a wife, and this toast should be to the President and his wife." (*Applause.*)

The PRESIDENT, who was loudly cheered on rising to reply, said that to occupy the Chair of the Association was one of the greatest honours which could befall anyone in this country, and he felt very unworthy of the position. He would like officially to thank the University of Birmingham most profoundly for their reception the previous night. A gathering such as the Annual Meeting was not the work of one man but of many, and it was fitting that he should say that everything that had been done for the Annual Meeting was the work of the finest team imaginable. He would like to thank all the members of the Organising Committee, and all that wonderful group of men who had been so loyal to him, most of them fellow-students with him, though much younger than himself. Every one of them had put aside his personal affairs to help to create what they hoped would

be the most wonderful Annual Meeting that the Association had ever had. He would also like to thank most sincerely the Council and the secretariat for all that they had done. (*Applause.*)

The proceedings then terminated.

Photograph of the Dinner

Copies of the photograph of the Annual Dinner can be obtained by application to Messrs. H. J. Whitlock & Sons, 39, Corporation Street, Birmingham. Three sizes are available, viz. : 12 in. × 10 in., 7s. ; 10 in. × 8 in., 5s. 6d. ; 8 in. × 6 in., 4s. 6d.

ROYAL COLLEGE OF SURGEONS OF ENGLAND

At a meeting of the Council of the College held on July 13 Professor L. R. Cahn, Columbia University, and Mr. Muhammed Abdul Hag, Lahore, were elected Fellows in Dental Surgery.

PROPOSED BONUS FOR P.D.O.s

Coventry Education Committee have adopted a recommendation that a bonus of £200 per annum should be paid to school dental officers in the employment of the authority. This recommendation is subject to the approval of the City Council Salaries Committee and is to be a temporary arrangement pending the settlement of a national scale of salaries.

BONE AND TOOTH SOCIETY

The Society had its first Scientific Meeting at the Institute of Orthopædics, 234 Great Portland Street, London W.1, on Tuesday, June 6, 1950, at 5 p.m. This took the form of a symposium on Bone Structure at which Professor W. D. Newcomb took the chair.

The Bone and Tooth Society aims at providing a discussion ground for those interested in fundamental laboratory studies on bones and teeth. The interim committee is drawn from various branches of the subject, thus Ivor Kramer represents dental interests, C. H. Lack clinical, J. J. Pritchard anatomical, H. J. Rogers biochemical and H. A. Sissons histological with T. F. Dixon secretary. The committee plans to hold quarterly symposia with occasional meetings for casual communications. The next meeting is planned for October 3, at the Eastman Dental Hospital when it is hoped to hold a symposium on " Tooth Structure." Further particulars can be obtained from the secretary at the Institute of Orthopædics.

MONOPOLIES COMMISSION

In a written reply the Parliamentary Secretary to the Board of Trade said that he hoped to receive the first report of the Monopolies Commission before the end of the Summer Recess. It would subsequently be laid before Parliament in accordance with the requirements of the Monopolies and Restrictive Practices (Enquiry and Control) Act 1948.

It will be remembered that one of the enquiries being undertaken by the Monopolies Commission relates to the supply of dental goods and equipment.

REST-BREAKS HOUSES

Rest-Breaks Houses were originally instituted to provide accommodation of a high standard for the use of nurses and midwives who need rest or post-convalescence at a reasonably low rate. The houses are fully staffed and breakfast in bed is the usual practice. The atmosphere is that of a comfortable, well appointed hotel, and the charges are four guineas a week for qualified persons and three guineas for students. These facilities are now available to members of the dental profession, of either sex, who are working for the health or allied services and to dental students in training. The Council for the Provision of Rest-Breaks Houses has three houses :— Barton House Hotel, Barton-on-Sea, New Milton, Hants.; Daygrange Hotel, near Melrose, Roxburghshire; and Peveril House, Buxton, Derbyshire. Further particulars with reference to the scheme can be obtained on application to the Secretary, Council for the Provision of Rest-Breaks Houses for Nurses and Midwives, 106, St. Clement's House, Clement's Lane, London, E.C.4.

The Schools

THE UNIVERSITY OF BIRMINGHAM

Withdrawal of Dental Diploma

In October 1951 the present regulations for the Diploma in Dental Surgery (L.D.S.) will be withdrawn and the Diploma abolished.

The degree of Bachelor of Dental Surgery (B.D.S.) and the degree of Master of Dental Surgery (M.D.S.) will be the only registrable qualifications in Dental Surgery granted by the University.

New regulations for the award of the degree of Bachelor of Dental Surgery have been approved and will come into force for students entering the School of Dental Surgery on or after October 1951.

MANCHESTER UNIVERSITY

Professor F. C. Wilkinson, F.D.S. R.C.S.Eng., has resigned from the Chair of Dental Surgery and the Deanship of the Dental School. He has been appointed Director of the Eastman Dental Hospital and Director of Studies of the Institute of Dental Surgery.

Examination Results

Royal College of Surgeons of Edinburgh.—*F.D.S.*—F. Abel, B.D.S. Univ. New Zeal.

Obituary

DR. CARL WITTHAUS

Mr. J. Menzies Campbell writes :

" Dr. Carl Witthaus, a distinguished member of the International Dental Federation, died, aged 81 years, at his home, at The Hague, on March 12, 1950. A few days earlier, he, along with a few old friends, quietly celebrated his sixty years' dental jubilee.

" Witthaus was an extremely modest man, who never sought praise or honour. His profession was his hobby ; and to have been able to serve it, for such a long period, was, to him, a great satisfaction. Right up to the time of his passing, his brain was clear, and his hands steady.

" He was, indeed, one of Nature's gentlemen, and will be affectionately remembered by all who were privileged to know him."

Births

MORRANT.—On July 19, 1950, at Farnborough Hospital, to Molly, wife of Guy Morrant, B.D.S., a daughter (Barbara Lois).

PRICE.—On July 12, 1950, at Stafford, to Barbara (*née* Denton), wife of Donald W. Price, L.D.S., a son (Jeremy Jonathan)—a brother for Christopher and Nicholas.

Deaths

BUTCHART.—Charles Kynoch Butchart, L.D.S. R.C.S.Edin. (1903), passed peacefully to rest at his home, July 25, 1950, aged 70.

PRINGLE.—On Saturday, July 8, 1950, Laurence F. I. Pringle, L.D.S. R.C.S.Eng., of 109, Accrington Road, Burnley.

BRITISH DENTAL JOURNAL

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